

**IS DESIGN  
DELIGHTFUL?**

HAZAR TAISSIER  
EID MARJI

EXPLORING DESIGN STUDENTS'  
EMOTIONAL EXPERIENCES  
DURING THE DESIGN JOURNEY



UNFOLDING



DESIGN STUDENTS' EMOTIONAL  
EXPERIENCES JOURNEY

**Is Design Delightful?**

Exploring Design Students' Emotional Experiences during the Design Journey

Doctor of Philosophy Thesis, First Edition

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# IS DESIGN DELIGHTFUL?

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Experiences during the Design Journey



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This dissertation is submitted for the degree of Doctor of Philosophy  
August 2025



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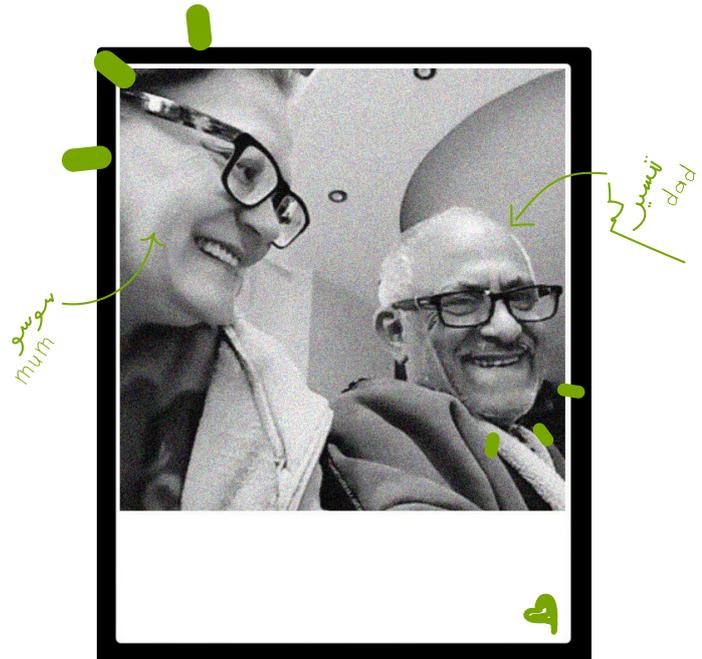
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Signed, **Hazar Taissier Eid Marji**

Date, **22<sup>th</sup> of August, 2025**



## Acknowledgments

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At one point, I almost lost hope. But then a wise man invited me and my best friend, Tasneem, to dinner. Maybe it was Korean, or maybe Japanese; I'm honestly not sure. I'm no expert. What I do remember clearly is what he said, *"You are going to do it. You will start the journey, and one day, you will be telling your stories"*. Thank you, Professor Gordon Mitchell, for that powerful push. At that time, I was standing at the edge of exhaustion. My energy was fading, but my motivation never left me. Then the journey started!

This journey has been anything but easy, and along the way, many heroes have stepped in, each leaving their mark on the path that brought me here. It all began during evening walks with my **father, Taissier**, through our neighbourhood in our hometown Irbid, Jordan. He isn't a designer, but those walks became our shared design studio. He listened patiently, asked thoughtful questions, and helped me untangle the web of ideas in my head. At home, my **mother, Sahar**, waited with eyes full of care and hope, always asking the same question: *"Did you figure it out?"* She asked even though she knew the answer might mean I would be away for a long time. That quiet patience and her strength in holding space for me were one of the greatest gifts. My father and my mother are the first and most important heroes in this journey, and for that, my deepest thanks go to them.

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This research is not just mine, it is yours as well. It is the hardest thing I have ever done, but also the most meaningful.

**Thank you!**



## Thesis Published Work

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This thesis includes previously published peer-reviewed papers across different forms. The research outputs based on this topic comprise one book chapter, one journal article, and two conference papers.

### Book Chapter

Carefully Designed: Transforming Design Process with Care

Hazar Taissier Marji

*Marji, H. T., (2025). Carefully Designed: Transforming Design Process with Care. In Bremner, C Rodgers, P. A., Innella, G, & Magee, J (Eds.), The Design of Care (1st ed). Routledge, USA. In Press.*

### Journal Papers

Emotion Tracking: Examining the Emotional Journey of Final-Year Design Students.

Hazar Taissier Marji, Paul A. Rodgers, Ross Brisco

*Marji, H. T., Rodgers, P. A., & Brisco, R. (2025). Emotion Tracking: Examining the Emotional Journey of Final-Year Design Students. The Design Journal. (Accepted/In press).*

### Conference Paper

#### DS: DESIGN2024

The EmotionProbe: an exploration of design students' emotions when designing.

Hazar Taissier Marji, Paul A. Rodgers, Ross Brisco

Paper presented at the 18<sup>th</sup> International Conference, Dubrovnik, Croatia.

*Marji, H. T., Rodgers, P. A., & Brisco, R. (2024). The EmotionProbe: an exploration of design students' emotions when designing. DESIGN2024: Proceedings of the Design Society 18th International Design Conference, 20-23 May, Dubrovnik, Croatia, 1015-1024. <https://doi.org/10.1017/pds.2024.104>*

#### DRS2024: Boston

Is design delightful? An examination of design students' emotions when designing.

Hazar Taissier Marji, Paul A. Rodgers, Ross Brisco

Paper presented at the 12<sup>th</sup> International Conference, Boston, USA.

*Marji, H. T., Rodgers, P. A., & Brisco, R. (2024b). Is design delightful? An examination of design students' emotions when designing. DRS2024 Boston: Resistance, Reflection, Recovery, Reimagination, Proceedings of the Design Research Society Conference 2024, 23–28 June, Boston, USA. <https://doi.org/10.21606/drs.2024.463>*



## Abstract

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Design is inherently emotional journey, requiring designers to navigate various challenges of decision-making and problem-solving while engaging with uncertainty and iteration. Although research in design has long examined the emotional experiences of end-users, there remains limited focus on the emotions of designers themselves, particularly within the context of design education, where students first develop their design knowledge and identity. This research addresses this gap by exploring the emotional experiences of design students during their design process, investigating how emotions emerge, manifest, and influence their engagement and achievements during the design journey.

Building on psychological theories of emotion and design process frameworks, this research situates emotions as dynamic forces that not only shape students' behaviours and decisions but also affect their motivation, resilience, and learning outcomes. The central research question **Is Design Delightful?** guides the investigation, supported by three sub-questions: what emotions design students experience, how these emotions influence their design process, and how emotions can be effectively incorporated into design education. To address these questions, the research adopts a mixed-methods approach that combines qualitative and quantitative data collection. Two new cultural probe research tools, the EmotionProbe and the EmotionTracker, were developed to capture students' emotions across short- and long-term design projects, supported by questionnaires, semi-structured interviews, a focus group, and a workshop. Together, these methods provided a comprehensive picture of students' emotional journey across different design process stages.

The findings reveal that students experience a broad spectrum of emotions that include neutral states such as feeling 'fine' within the emotional transitions. The research uncovers new, previously underexplored emotional phenomena, including Emotionlessness State and the Design Neutral Schema. In addition, the research highlights the imbalance between positive and negative emotions and the process stage distribution during design projects. Crucially, the study identifies the absence of anger as a reported emotion, despite its potential as a constructive and motivating force, and argues for its inclusion within design pedagogy through safe, structured exploration.

This research contributes new knowledge to the design field in three significant ways: first, it introduces innovative methodological tools for documenting and analysing emotional experiences in design, second, it advances understanding of the patterns and impacts of emotions on students' design processes, and third it calls for rethinking design education by integrating emotional awareness as a central component of studio learning. By reframing emotions both positive and negative as valuable resources rather than obstacles, this study enriches design education, shaping how design students engage with their design work flow.



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## Glossary

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| <b>Term</b>                      | <b>Meaning</b>   |
|----------------------------------|--|
| <b>Design</b>                    | Design is an action of creation, a mindset and a process that creates meaningful solutions through planning, adaptation, and execution.  |
| <b>Designer</b>                  | The person who is responsible for the doing and making of design or plan   |
| <b>Process</b>                   | As a noun is a series of actions taken to achieve a particular outcome or the natural growth of an organism. As a verb, it describes performing operations to alter or preserve something or move in a procession.   |
| <b>Design Process</b>            | An iterative and often non-linear activity that involves a series of stages aimed at solving problems and making informed decisions. It embraces the messy reality of design work, where revisiting earlier steps, rethinking assumptions, and making forward leaps are essential characteristics  |
| <b>Design Method</b>             | A structured approach that guides the selection and use of design tools to serve the research purpose and includes observing, learning, asking questions, prototyping, testing, evaluating, and communicating.   |
| <b>Design Tool</b>               | A specific technique or instrument used to collect data or insights that align with the research goals and inform the direction of the design research.  |
| <b>Design Project</b>            | Well planned assignment with goals and end date.   |
| <b>Design Activity</b>           | Part of a project made up of tasks.  |
| <b>Design Task</b>               | Small part of project or activity.   |
| <b>Probe</b>                     | Research method tool can make the invisible visible, capture fragmentary data, and elicit inspirational responses from participants and typically introduced as a designed kit containing various instruments, or objects tailored to fulfil specific research tasks, assignments, or activities.  |
| <b>Cultural Probe</b>            | The artistic approach where data is collected by a kit designed for the study aiming at creating a space for new possibilities and being away from any information that can be understood through the needs and desires.   |
| <b>Affect, Effective Process</b> | The broader abstract term that refers to the experience of feeling or emotion. It is often described as the outward expression of emotion used to distinguish the various phenomena by their characteristics (acute, intensity, duration) or the source of stimulation and origins. It can be positive, negative, or neutral and is often described as valence (positive/negative) and arousal (intensity, activation/deactivation). |
| <b>Emotion</b>                   | The connection between an individual and a particular object, a bond that may last only seconds or minutes. This process arises when a stimulus is instantly or reflectively interpreted, triggering emotional reactions and prompting attempts to regulate emotional behaviour often short-lived and have an evolutionary basis, serving adaptive and survival functions.   |
| <b>Feeling</b>                   | The subjective conscious experience of emotions which have a distinctive structure evoked by sensations or images and emerge in thoughts. It is the longer-term period.  |
| <b>Appraisal</b>                 | The subjective meaning and how each individual copes and evaluates certain events, and individual's accumulated experiences.   |

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| <b>Emotional Experience</b>        | Emotion experience refers to the conscious awareness and perception of emotions, which can vary depending on the focus of attention, the mode of attention (synthetic vs. analytic, immersed vs. detached), and the context in which the emotion occurs. It involves the perception of a meaningful world or oneself as emotionally significant, often characterised by feelings of pleasure or pain, action readiness, and appraisal of the situation. |
| <b>Emotional Components</b>        | Three criteria for emotional components: emotional responses are triggered by an emotion selection mechanism; emotions occur only when personally significant issues arise; and emotional episodes are typically brief and unstable. However, a debate is always the case when discussing emotion.  |
| <b>Emotion State</b>               | Emotional phenomenon characterised by its intensity, temporary, short duration, and situation-dependent.  |
| <b>Emotion Trait</b>               | Emotional phenomenon characterised by its frequent occurrence, longer-lasting nature and persistence over time.   |
| <b>Emotion Significant</b>         | When an event is appraised as personally relevant to one or more concerns, forming the emotional responses which includes the individual interpretation of the meaning related to the root of one's previous experiences and situations.  |
| <b>Achievement Emotions</b>        | Specific emotional experiences tied to individuals' achievements or performance in various domains, such as academics, sports, work, or personal goals. As a subset of academic emotions, they are defined as emotions related to achievement activities and outcomes.  |
| <b>Object Focus</b>                | Explains that academic emotions arise from two key psychological appraisals: subjective control (a student's perceived control over their learning and achievement) and subjective value (the importance they assign to academic tasks and outcomes). This is consist of the activity emotion and outcome emotion.  |
| <b>Activity Emotions</b>           | Emotions experienced during learning activities. How students' perceived control over their learning.   |
| <b>Outcome Emotions</b>            | Emotions experienced related to academic results. The importance students' assign to academic tasks and outcomes.   |
| <b>Neutral Emotion</b>             | Refers to emotional experiences that lies in the middle of the emotional spectrum, neither clearly pleasant nor painful. Unlike emotions with distinct valence or arousal, neutral emotions are marked by an absence of strong emotional charge and represent experiences where affective categorization is ambiguous or unclear.   |
| <b>Emotionlessness State</b>       | An emotional state of detachment where an individual experiences a lack of emotional connection, motivation, or investment in their work. This state is characterised by an absence of positive or negative feelings towards a specific stage the process, resulting in a sense of numbness or neutral-like engagement.   |
| <b>Design Neutral Schema (DNS)</b> | A representation of neutral emotions including satisfaction, contentment, boredom and 'fine' that illustrate detachment converge that gradually lead to the Emotionlessness State. Whether it begins with positive or negative neutrality, the process reflects a fading of emotional engagement and results in a layered sense of disengagement.   |



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*This chapter outlines the main research topic on which this thesis is built. It highlights the intersection of design and emotion as a field that influences and interacts with students' design journey. The chapter also presents the motivation behind this research, introduces the methodological approach, and provides an overview of the thesis structure to guide the reader through the following chapters.*



01

CHAPTER  
ONE

INTRODUCTION

## 1.1 Research Intent

Designers navigate a journey filled with countless emotions because they carry the weight of imagining and shaping solutions for increasingly complex global challenges during a process that involves heavy decision-making and problem-solving. Along the way, they reflect, build relationships, make decisions, create, evolve and grow up through their emotional experiences. These emotional experiences are linked and varied, depending on the different stages of the design process. Given psychology's long legacy in studying emotions, this research builds its literature research on psychological models and theories of emotion to explore design students' emotional experiences during the design process in an educational context.

Emotions are understood as a complex interaction of experiences that operate on multiple levels. Research has often framed emotions as a guiding force that enriches life, adds meaning to everyday moments, and enhances our perception of value over time (Larsen et al.). Frijda and Mesquita (1994) suggested that *"Emotions are complex, structured phenomena. They are not mere feeling states, that is, intraindividual states of conscious awareness that might as well remain within the confines of the individual's mind. They are effective responses to what happens in the environment"* (1994, p. 51). Further, the design process integrates multiple layers of information and details, making it an inherently sophisticated and iterative process (Ho, 2024; Milton & Rodgers, 2013). A common ground between emotion and design lies in the complexity and absence of a clear boundary where one state transitions into another. A designer may experience a specific emotion while working in one stage, only to transition to a different stage moments later, accompanied by an entirely different emotion. Therefore, understanding the role of emotions in designers' Journey is important in enriching their decision-making and problem-solving processes and fostering more meaningful and impactful achievements (Ho & Chau, 2016). This understanding should begin at the earliest stages and during a designer's education path, where, as design students, they first inherit and develop their design knowledge. Recognising and addressing emotional experiences from the beginning arises by acknowledging the emotional patterns and influencing factors that emerge during the design process, impacting the overall experiences of design education (Dybvik, 2022; Kloeckner et al., 2017; Park, 2004; Pekrun & Linnenbrink-Garcia, 2014). Additionally, increased interest has been shown in investigating emotion in education, even though conducting emotional research within an educational setting presents many challenges (Schutz & DeCuir, 2002).

With this in mind, the journey every designer undertakes, progressing from initial activities to eventual achievements, provides clear evidence of the emotional experiences embedded in each stage of the design process. There is a need for such a study since design research nowadays overwhelmingly prioritises human-centred design and explores end-users' perceptions and emotions (Forlizzi et al., 2003). Moreover, the visibility and understanding of the designers' own emotions throughout the design process, emotions that play a part in shaping their achievements, have yet to receive the attention they deserve in design research

(Ho, 2015). The limited research on emotions that includes design students within design education adds to the need for deeper exploration in this area.

## 1.2 Research Motivation

This research reflects my deep-rooted passion for design education enhancement, which began during my work as a design tutor at the Department of Design and Visual Communication at the German Jordanian University (GJU), Jordan. Teaching and collaborating with design students from diverse backgrounds allowed me to observe their approaches in tackling design projects, solving problems, and making decisions. Additionally, the university's exchange program with Germany provided me with the opportunity to engage with international students, further broadening my perspective on design learning experiences. As a designer myself, I navigate the same design processes that students go through, experiencing the challenges and emotional shifts embedded in my design work. This dual perspective, as both a designer and a design tutor, has not only intensified my interest in the subject but has also sparked a profound curiosity in me about design students' emotional experiences throughout their design process. Witnessing how emotions impact their actions and performance during projects led me to continuously question: How do students feel during their design process? How can I understand them better? Why do they experience certain emotions? What makes each student's design process unique? Why do some students thrive in research while struggling in production, while others face different challenges?

I constantly question myself, and all questions point to the emotions behind students' design process during the design journey. Reflections helped me understand that all these curiosities come from my caring about students. I discovered that we cannot run from our emotions, but we are hugely affected by them, and we don't talk about it, especially as design tutors; we rarely discuss or actively seek to understand the emotional aspects of students' emotional Journey. This may be caused by the fact that the educational pedagogy doesn't support the emotional aspect, or could be because of the lack of awareness of the impact of emotions and the lack of understanding of how to benefit from them as a force. In addition, maybe because we don't have the open space and dialogue between the tutors and the students within a clear educational framework. This realisation has fuelled my interest in digging deeper into this approach, examining the emotions influencing students, and observing their experiences flow throughout a design project.

After three years of studying design and emotions, my perspective has shifted significantly. Initially, I believed that students struggled with the design process because they didn't enjoy it. As a design tutor, this led me to constantly explore ways to make the journey more enjoyable for them. However, what I found was surprising. Students do enjoy the process, but their comfort and relaxation often lead to disengagement, unintentionally impacting their design process workflow.

This realisation shifted my focus from enhancing enjoyment to fostering deeper engagement and care in the design process. Rather than simply making the experiences more enjoyable, the goal became to use emotions as a motivator to encourage students to be more actively involved and invested in their work. This understanding forms the final part of this thesis, exploring how emotions can drive greater engagement, commitment, and resilience, helping design students navigate challenges and overcome obstacles throughout their design journey.

## 1.3 Research Focus and Context

### 1.3.1 *Shared Ground between Design and Emotion*

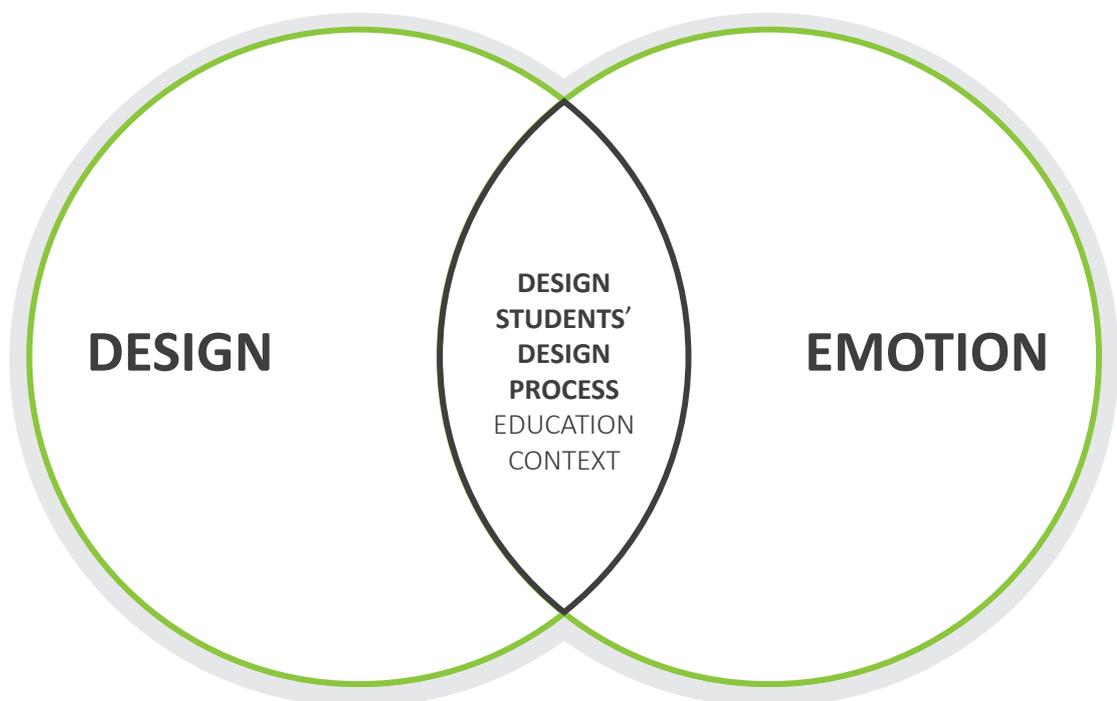
Establishing the Design and Emotion Conference in 1999 (Desmet & Hekkert, 2009) highlighted the popularity of design and emotions research. Since then, notable publications and increased interest and research have been dedicated to this topic. Hence, the design community and researchers have witnessed a growing number of frameworks that emphasise the impact of designed objects on consumers and explore ways to enhance the emotional experiences, often with a strong focus on the end user. However, this approach tends to create a one-sided understanding of design, prioritising audience needs and emotional responses and focusing less on the emotional experiences of designers themselves during the design process. Conversely, research suggests that emotional input within the design process is essential (Tang et al., 2021), playing a noteworthy role in problem-solving and decision-making (Ho, 2015; Park, 2004; Sas & Zhang, 2010). Therefore, designers need to focus on managing, regulating, and understanding their emotions.

Design, as Glanville (2006b) proposed, involves a self-conversation that underscores the importance of being receptive and listening. Design revolves around the conception and realisation of novel ideas, achieved through planning and crafting processes (Archer, 1979; Cross, 1982). Within this understanding, the emotionalised aspect of design, as highlighted by Ho and Siu (2012), emerges as a key component. Designers use their emotions to guide them toward solutions and reshape the design process (Cross, 1982; Crossley, 2003; Dybvik, 2022; Ho, 2014). Moreover, research suggests that emotions can enhance designers' ability to optimise their decision-making and outcomes during the design process (Ho, 2015; Tang et al., 2021).

Various studies have investigated the role of emotion within the design process (Desmet & Hekkert, 2009; Dorst & Cross, 2001; Forlizzi et al., 2003; Ho, 2014). The iterative nature of the design process encompasses exploration and experimentation cycles, often involving rejection and reiteration phases (Glanville, 2009) shaped by both external and internal factors, which are heavily influenced by emotion, subsequently impacting the design journey (Ho & Chau, 2016). Moreover, research indicates that emotions enhance information processing, communication, and categorisation (Park, 2004). Furthermore, emotions enhance flexibility and the ability to establish connections, expanding one's scope of attention and action (Fredrickson, 1998; Isen & Baron, 1991). Emotions are the driving force

behind engagement, motivation (Reeve, 2024), and excitement throughout the design process (Sas & Zhang, 2010). Desmet et al. (2023) Introduces the concept of 'micro emotions' to inform design enhancements, aiming to enrich emotional experiences and inspire novel design inventions.

Figure 1-1 represents the core focus of this research, situating design and emotion as the two main domains of study. The overlapping section highlights the educational context, which is the common ground where these two areas intersect. This research specifically investigates the emotional experiences of design students during their design process, recognising that while education plays a role, education is not the primary focus but rather a setting in which these experiences unfold. The study aims to understand how emotions manifest and evolve throughout the design process, shaping students' design Journey and decision-making. By emphasising the emotional dimension within design practice, this research seeks to bridge the gap in understanding how design students experience emotions, an aspect often overshadowed in the design journey.



*Figure 1-1. Thesis Core Focus.*

Exploring the connections between emotion and design in the students' design process within an educational context highlights a requirement to develop methods to report emotion during the design process. The necessity for such methods arises from the minimal investigation into how designers can comprehend and manage their emotional footprint (Norman, 2004).

### 1.3.2 Design and Emotion Exploration Levels

The design process is characterised by circularity and a willingness to navigate the unknown, often involving rejection, restart and trial-and-error (Glanville, 2009). Navigating the design process is inherently personal, with each designer's experiences including a unique range of emotions. While one designer may feel excitement during design research, another may experience anxiety. These emotions are temporary in their nature and can be impacted by different factors, whether external or internal, which in turn impact the process (Ho, 2015). Hence, the concept of design and emotion is broad, and clear boundaries do not characterise their experiences. Yet, the emotional experiences of the design process within a project can be understood through two key aspects: activity and achievement, both of which are demonstrated along the dimension of valence and arousal (Figure 1-2). Defining these exploration levels helps understand, evaluate, and identify connections within the design process's emotional dynamics. These levels establish a shared ground between design and emotions, offering deeper insight into the contribution of emotions throughout the design process.

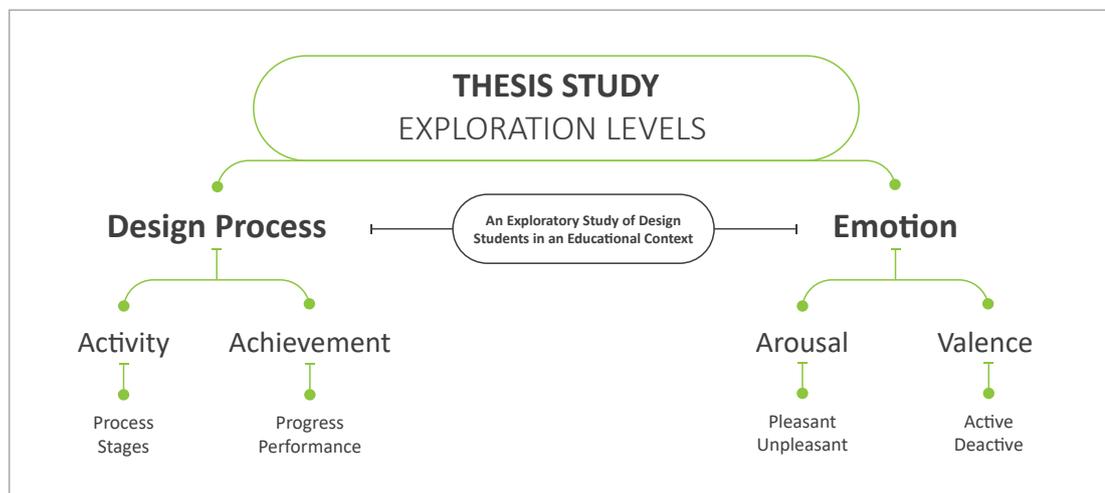


Figure 1-2. Thesis Study Aspects.

### 1.3.3 Why is this Context Important?

Most designers begin their design journey as learners/students within design educational institutions and pass through a non-stop number of experiences along the journey path. Engagement during a learning process is an important indicator of improvement and progress (Altuwairqi et al., 2021). Hence, emotion research in education is dedicated to investigating sets of academic emotions (Pekrun, 2006; Pekrun et al., 2002a). With that in mind, emotions in design have gained increasing interest due to their strong presence in designers' actions, behaviours, and processes, playing a role in understanding and development (Norman, 2004). In addition, the designer's ontological process positions design within its own space (Galdon, 2025), requiring diverse skills to navigate uncertainty and tackle problems from multiple perspectives (Cross, 1982; Milton & Rodgers, 2013).

Designer vision can be more powerful when designers employ their emotions (Crossley, 2003), which impact their decision-making (Ho, 2015; Utriainen & Valtonen, 2022), the management of the process (Sas & Zhang, 2010) and the transformation of complex problems (Dorst & Cross, 2001).

The importance of this research arises from the role of emotional awareness during the design process in enhancing students' design experiences. Being attuned to emotions throughout the design journey allows designers to navigate challenges more effectively, make informed decisions, and foster deeper engagement with their work (Crossley, 2003). There is a clear need to understand emotions from the earliest stages of a designer's journey, as this knowledge can help them better integrate emotional intelligence into their process, leading to more meaningful, reflective, and innovative design outcomes (Utriainen & Valtonen, 2022). By recognising emotions, designers can enhance their design progress, expand their perspectives, and develop a more holistic approach to problem-solving in design (Ho, 2014).

Furthermore, the intersection of emotion and design is a huge area of study, and key principles that are essential for managing emotions in the design process include understanding one's own emotional changes and their impact, managing and controlling emotions effectively (Southward et al., 2021) and using emotions to drive motivations (Reeve, 2024). Therefore, investigating emotions embedded in the design process is necessary (Tang et al., 2021). While design research has gained increasing visibility, the understanding of how emotions manifest throughout the design journey, influence the process (Ho, 2015) and shape students' experiences remains underexplored. Additionally, understanding emotions and learning how to manage them can help students refine their design process, leading to a more effective and enriching design education experience (Ho, 2024). In particular, research dedicated to students' emotional experiences within the design process is still limited, reinforcing the need to focus on this context to bridge the existing gap in knowledge (Tang et al., 2021).

This research does not focus on the final outcomes or the emotions of the final product and how they may evoke emotions in others. Instead, this research is dedicated to students' emotional experiences during the design process, exploring their emotions during the design process activity and self-achievements resulting from their work. Additionally, this research includes different groups of students with different backgrounds, yet it does not aim to compare; rather, it serves as a stronger element in exploring emotions across various individuals without any comparative analysis.

## 1.4 Research Questions

The main research question of this PhD research, **Is Design Delightful?** aims to contribute much-needed empirical research and analysis on the emotional experiences of design students during the design process within an educational context. Three supplementary questions have been defined to explore the main question, guiding the research methodology and shaping the investigative approach (Figure 1-3). The supplementary questions and their related sub-questions are as follows:

### **RQ1. What emotional experiences do design students encounter throughout the design process?**

*RQ1.1. What range of emotions do design students identify when designing?*

*RQ1.2. How do different emotions manifest in the students' design process?*

*RQ1.3. Are the students' emotional experiences pleasurable or otherwise?*

*RQ1.4. What are the dominant emotions experienced by design students?*

*RQ1.5. What significant emotional phenomena can be found in the design process?*

*RQ1.6. What is the meaning of emotions from the design students' perspectives?*

### **RQ2. How do the design students' emotional experiences affect their design process?**

*RQ2.1. What are the relationships between students' emotions and their design process stages?*

*RQ2.2. How are emotions and design process stages distributed throughout the design process?*

*R.Q2.3. What are the factors impacting students' design process?*

### **RQ3. How can the emotions of design students be effectively incorporated into their design process journey?**

*RQ3.1. What is the usability and reliability of emotion tracking tools during the design process?*

*RQ3.2. How can we promote the employment of emotion in design education?*

*RQ3.3. What strategies can be employed to incorporate emotion in the design process?*

*RQ3.4. How can design tutors create a space for students to explore their emotions productively?*

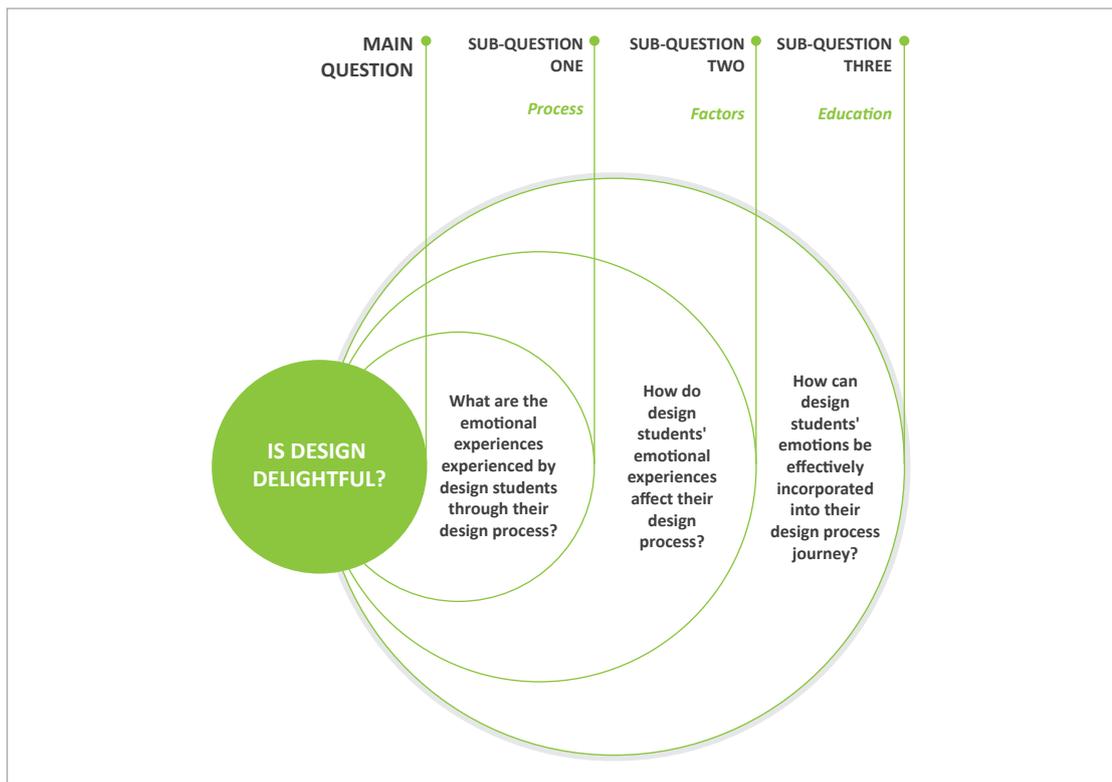


Figure 1-3. Thesis Main Questions.

The first sub-question establishes the foundation for exploring what emotions design students experience during their design process. Through an exploratory study, this study seeks to identify the range of emotions, examine how these emotions manifest throughout the design process, and the emotions connected to the design journey.

The second sub-question digs deeper into design students' emotional experiences by investigating why they feel certain emotions during certain design process stages, exploring the factors that influence these experiences, and examining how the experiences are distributed.

The third sub-question builds on the findings from the previous questions, aiming to propose answers to how to encourage students to use their emotions as a source of motivation. This, in turn, provides recommendations for design education, advocating for integrating emotional awareness into the design process to enhance both design education and practice, as well as students' engagement and well-being.

This research is about the design students' journey infused with emotions. The exploration of emotional experiences in today's design students highlights the role of emotions in shaping actions, problem-solving, and decision-making. Perhaps more than many other professionals, designers can harness their emotional experiences to enhance and elevate their design process, opening up new possibilities for exploration and innovation. Embracing, understanding, and processing emotions, whether positive or negative, significantly

influences how design students perceive and practice their profession, ultimately impacting design education as a whole. This research intends to help define the emotional patterns and states that emerge within the design process, where design students can create meaningful, reflective, and impactful work by acknowledging and integrating their emotional aspects.

This research attempts to explore the emotional aspect more thoroughly, where a particular emotion vanishes from the narrative while other emotions assert their presence powerfully and pinpoint design students' main challenges in their design journey.

## 1.5 Research Aims and Objectives

The main purpose of this study is to explore the emotional experiences of design students during the design process and examine how these emotions, in turn, influence and shape students' design Journey. Emotions' importance has been widely acknowledged in education as they influence students' learning, achievements, engagement, motivation, solving problems, and decision-making throughout the design process. Yet, a more in-depth study towards design students' emotions is much needed.

This doctoral research will examine the following aims:

**RA1: To identify the emotional experiences of design students during their design process by:**

Investigating the emotional ranges during the design process.

Identifying the emotions related to the design process within the design educational context.

Understanding the meanings associated with emotions from the design students' perspectives.

**RA2: To identify the patterns in students' design Journey by:**

Highlighting the emotional experience patterns during the students' design process.

Highlighting the most challenging stages of the students' design process.

Establishing connections between emotions and mapping the network among them.

Spotting emotional phenomena connected to the design students' design process.

**RA3: To identify the impact of the emotional experiences on students' design process by:**

Defining the internal and external factors affecting students' emotional experiences.

Illustrating how the emotional experiences impact students' decisions concerning the design process, progress, and transitions.

Promoting the use of emotions and transforming what is perceived as negative emotions into motivators throughout the students' design process.

## 1.6 Research Audience

Driven by my own interest and motivation to pursue this investigation and develop it into this research, the research questions explored remain highly relevant and valuable to a broader audience.

This research aims to impact design students' practice and education, and change how tutors understand the student journey and set a goal for design research from the perspective of emotional needs. This research will provide insights into the emotional experiences embedded within the design process. The literature review is structured to establish a theoretical link between psychological frameworks on emotion and design, focusing on the presence of emotion in the design process. By studying these disciplines (emotion and design), this research lays the groundwork for a deeper understanding of emotional engagement in design education and its implications for learning and professional development.

Consequently, this research is a valuable resource for design students to encourage them to explore and navigate their emotions throughout the design process. Students can enhance their engagement with projects by understanding the origins and reasons behind their emotional experiences, ultimately influencing their future professional practice within the industry. Additionally, this study offers design tutors insights into the role of emotions in design education, providing a starting point to develop emotion-centred projects that leverage the power of emotions to enrich learning experiences and create deeper engagement in the design studios. For design researchers, the findings contribute to an understanding that supports further research, expanding existing knowledge on both design education and practice.

## 1.7 Contribution to New Knowledge and Understanding

The research represents a substantial contribution to new knowledge and understanding. Methodologically, the research introduces new emotional data collection tools specifically designed and developed according to the design process, which will be detailed in chapter three. The findings contribute to a deeper understanding of design students' emotional experiences during the design process, highlighting the emergence of specific emotional patterns, such as the imbalance between positive and negative emotions, and the appearance of new emotional states and phenomena. Additionally, the study identifies the absence of anger in students' design process and the advocacy for promoting and encouraging the open dialogue of emotion within the design journey of students. The new knowledge and understanding that this research contributes can be presented as follows:

- **Development of two new design research tools to explore students' emotional experiences in the design process**

This research introduces two novel tools, the EmotionProbe and the EmotionTracker, designed to investigate and capture design students' emotional experiences throughout their design process. These tools offer innovative ways to access and reflect on emotions during different design stages.

- **New insights into emotional patterns during the design process**

The research uncovers previously unclassified emotions, such as feeling 'fine', and reveals interrelations between emotions like contentment, satisfaction, 'fine', boredom, and their relation to the neutrality experiences. These findings point to the emergence of new emotional phenomena and map patterns that connect emotional experiences with disruptions and transitions in the design process.

- **Advancing the role of emotion (especially anger) in design education**

The study advocates for rethinking how emotions are treated in design education, specifically focusing on anger. The research presents new arguments for embracing anger as a strategic and constructive emotional force and calls for normalising emotional experiences through open dialogue, awareness, and integration into pedagogical practices.

More explanation will be highlighted in chapter six: conclusion and future work.

## 1.8 Research Methodology

This research uses exploratory mixed-methods research, beginning with a question and then investigating and analysing the answers. Thus, design research arises from an observation that demands further exploration and understanding, originating from a curiosity-driven question and the need for deeper insight, which in turn shapes and guides the subsequent research steps (Davis, 2014; Rodgers & Yee, 2023).

The implementation and acceptance of the mixed methods approach in research have increased (Clark et al., 2021). Accordingly, a mixed-methods approach was utilised to collect and analyse design students' emotional experiences during the design process. Qualitative and quantitative research was conducted to answer study questions. Hence, qualitative research is a method that emphasises the examination of words rather than numbers. Therefore, quantitative research only is insufficient for examining certain topics since *"This ability for self-reflection cannot be found among the objects of the natural sciences"* (Bryman, 2012, p. 178). However, quantitative research examines numerical data from surveys, questionnaires, or polls (Babbie, 2020) and this strengthens the research approach. Given that reason, quantitative research was used in closed-ended and scale response questions. As illustrated in Figure 1-4, the combination of methods was employed, starting from EmotionProbe and Emotion Tracker to explore what emotions students' experience during

the design process, moving to the feedback-sheet questionnaires and semi-structured interviews seeking a better understanding of why students experience these emotions, and ending with the Angry Design Workshop, to evaluate and validate the research results and know how to employ suggestion into the design education.

This research primarily focuses on design students, with a verification component involving design tutors and design professionals in the final stage. As a result, employing a mixed-method approach creates an in-depth investigation through a set of questions to elicit self-reflection from design participants (students/tutors/professionals), forming a stronger design research approach (Clark et al., 2021; Yee & Rodgers, 2018).

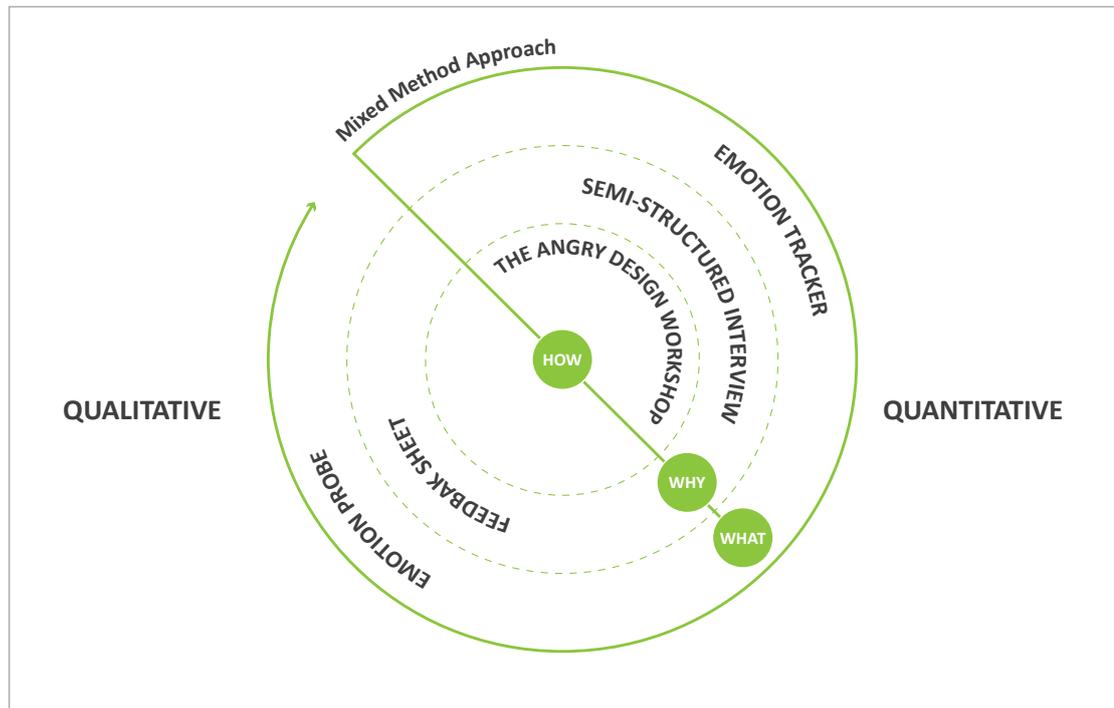


Figure 1-4. Thesis Methodology and Methods.

## 1.9 Thesis Structure

This thesis comprises six chapters that offer a deeper understanding of design, emotion, and their intersections. Every chapter will start with an introduction that highlights the main purpose of the chapter and how the structure will be. The research begins by introducing the topic and explaining the motivation behind the research. After identifying a gap in the literature, the study continues with the development and use of two research tools (cultural probes), presenting their results and analysis. As the research unfolds, key findings are revealed and discussed in more depth. The final chapter highlights the contributions of the study and suggests where and how they can be implemented. The thesis is organised as follows:

## **Chapter 1: Introduction**

This chapter presents an overview of the research. This includes the research intent, context and focus, questions, aims and objectives, audience, new contribution to knowledge, methodology, and motivation behind this research.

## **Chapter 2: Literature Review**

This chapter aimed to build an understanding by presenting the literature review related to two main areas: Design and Emotion. The chapter is divided into three main sections. The first one is entitled 'Design' which investigates how design evolved as a discipline and a practice and traces the various frameworks that structure the design process, highlighting definitions and tools developed as part of the designer's way of researching, as well as exploring the relation among design as an activity and as a process. The second section, entitled 'Emotion', traces the history of emotion studies drawn from models and theories in psychology literature and explores the various definitions of emotions, their fundamental components, and the key theories that have shaped our understanding of emotional experiences. The last section, entitled 'Design and Emotion', creates the link between the emotional experiences and the design journey within an educational context. The last section briefly reviews design education and emotions in education and discusses the role of emotion in both the design process and decision-making. By researching these elements, this chapter helped define the research gap and establish a base understanding that informs the development of the research questions and methodology approach.

## **Chapter 3: Methodology**

The methodology chapter outlines and justifies the research methods used throughout the study. A mixed-methods approach was adopted to guide data collection and analysis. The chapter is divided into two parts: the exploration study methodology and the verification study methodology. The first part of the chapter begins with a preliminary study using the EmotionProbe, a cultural probe designed to explore students' emotional experiences during a short-term design process. Insights from this stage informed the development of the primary study, which unfolded in three phases. First, the Emotion Tracker, a year-long cultural probe, was implemented to track students' emotions throughout an extended design project. Second, a questionnaire was distributed at the end of each semester to gather additional insights and complement the preliminary findings. Third, semi-structured interviews were conducted after the final project results were announced, providing more profound students' reflections. To conclude the data collection process, the second part describes the Angry Design Workshop, which was conducted as an evaluative step to assess and validate findings from both the preliminary and primary studies. All collected data were transcribed and organised to prepare for the following stages of analysis and result presentation.

## **Chapter 4: Results and Analysis**

This chapter presents the results of the research, structured around each individual study, and concludes with a summary at the end of each. Aligned with the structure of the methodology chapter, this chapter is divided into two main sections: the exploratory study and the verification study. The chapter draws on data collected through the EmotionProbe, Emotion Tracker, questionnaire responses, and semi-structured interviews. The chapter provides a detailed analysis of students' emotional experiences during the design process, examining the emotional spectrum they navigated, how emotions manifested at different stages, and how specific activities and achievements elicited emotional responses. These findings are situated within the context of design education and interpreted using the academic emotions framework, which offers a structured lens for understanding the emotional dimensions of educational context studies. Through this analysis, the chapter presents a range of data visualisations, diagrams, and figures to effectively illustrate and reflect the design students' journey from an emotional lens. The chapter also uncovers significant emotional patterns, connections, and recurring themes in students' experiences. These insights not only reflect the emotional engagement in design education but also highlight the relationship between emotions and the design process. The key findings and emotional links identified here serve as the basis for the deeper discussion and theoretical interpretation that follows in chapter five.

## **Chapter 5: Findings and Discussion**

This chapter synthesises and discusses all the findings from both the qualitative and quantitative data. Key insights are presented alongside a cumulative emotional mapping of students' journey, supported by visualisations that capture emotions across different stages of the design process. This mapping offers a broader understanding of how emotions evolve within the context of design education, with a focus on the interplay between emotional experiences and specific stages of the design process. The chapter explores various dimensions of the emotional journey, including traditional measures such as valence and arousal, as well as activity-related and achievement-related dimensions that are particularly relevant to the educational context. It highlights how students experience emotional shifts throughout the six identified design process stages, using new way to reveal emotional trends and disruptions. In addition, the chapter discusses neutrally observed emotions that emerged during the design process. At its core, the chapter presents key recommendations for rethinking emotions, not as obstacles, but as strategic components of both the design process and design education. The chapter concludes by reflecting on the methodological contributions of the research and summarising the significant findings insights.

## **Chapter 6: Conclusion and Future Work**

The conclusion chapter presents an insightful reflection on achieving the research aims, related objectives, and questions formulated for this research. This chapter also highlights the contributions to new knowledge that this research provided and the research impact. The chapter ends with the study's limitations and several recommendations and implications for future research in this area.

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*This chapter reviews key literature on design and emotion, focusing on their intersection within design education. It explores how emotions influence students' design processes, decision-making, and learning journey. By examining frameworks from design theory and emotional psychology, the chapter builds a foundation for understanding how emotional experiences shape and impact students' engagement with their design journey.*



02

CHAPTER  
TWO

LITERATURE  
REVIEW

## 2.1 Introduction

The study of design in relation to the emotional aspect, particularly within the context of design education, involves bridging two major fields and uncovering their connections. This research aims to strengthen the understanding of design students' emotional experiences throughout the design process by exploring how emotions evolve during their design journey and the relationships they form based on their emotions. This research seeks to gain valuable insights into how emotions can shape students' design process management and practice. Given this focus, the literature review approach was directed to explore design as an activity and as a process which consists of a series of steps. This was achieved by building understanding of the design process frameworks as a problem-solving, and as an act of decision-making. This part of the literature investigates how design evolved as a discipline and a practice. The research traces the various frameworks that structure the design process, highlighting definitions and tools developed as part of the designer's way of researching, as well as exploring the relation between design as an activity and as a series of acts.

Then, the literature explores the historical and theoretical foundations of emotions, drawing from the extensive legacy of psychological research. This review explores the various definitions of emotions, their fundamental components, and the key theories shaping the understanding of various emotional experiences. The literature looks at different models that describe the dynamics of emotions, their triggers, and their evolution over time. Additionally, the review investigates the tools used to study emotions, highlighting how these approaches contribute to identifying various emotional experiences. This part of the literature aims to establish an understanding of emotion complexity and the role of emotions in shaping individual experiences, to benefit the efforts in defining the research direction towards the impact of emotions on students' design process and decision-making, which in turn, impact their design journey.

Furthermore, this chapter briefly reviews design education and emotions in education and discusses the role of emotion in both the design process and decision-making. By researching these elements, the research seeks to create the link between the impact of emotional experiences and the design journey within an educational context. This literature offers an understanding of how engaging with emotions can influence design students' involvement in their design process. By highlighting the role of emotional awareness, the study explores how emotions can shape learning journey, to enhance students' overall design experiences.

Overall, the literature review is structured around three key areas (Figure 2-1):

- Design and design process: looking at design-related meaning, frameworks, evolution, developments, and focus shifts.
- Emotion: looking at meanings, interpretations, theories, and models.
- Educational: looking at study perspectives into design education and academic emotions.

Together, they establish the base understanding that informs the development of the research tools introduced in the following chapter and lays the groundwork for the discussions and insights presented in the findings and conclusion chapters.

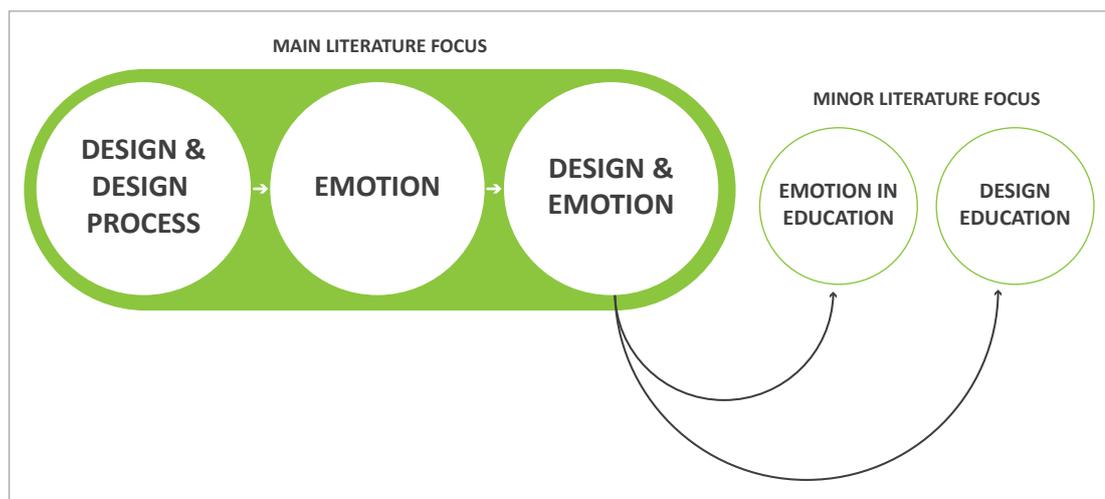


Figure 2-1. Thesis Literature Review Focus Areas.

### 2.1.1 Literature Contributors

Figure 2-2 presents the thesis research areas and related contributors. This research draws upon two primary theoretical areas which overlap and meet within the educational context for this research. The literature review is constructed as follows:

- Firstly, the literature develops the narrative starting from the design evolution that includes thoughts and perspectives from Buckminster Fuller (Fuller, 1957), Herbert Simon (Simon, 1969), Horst Rittel and Melvin Webber (Rittel & Webber, 1973), Victor Papanek (Papanek, 1971; Papanek & Fuller, 1985), Bruce L. Archer (Archer, 1965, 1979), Christopher Alexander (Alexander, 1966, 1971), John Chris Jones (Jones, 1970, 1980), Donald Schön (Schön, 1987), and Ranulph Glanville (Glanville, 2006b, 2006c). In addition, the literature on design research focusing on the design process based on the contributions of, Nigel Cross (Cross, 1982, 2000), Richard Buchanan (Buchanan, 1992), Christopher Frayling (Frayling, 1993), Alex Milton and Paul Rodgers (Milton & Rodgers, 2013).

- Secondly, emotional research discusses emotion models and theories, building upon the main contributions of psychology scholars, including Carroll Izard (Izard, 1977, 1991), Paul Ekman (Ekman, 1992a, 1992b; Ekman et al., 1972), Robert Plutchik (Plutchik, 1965, 1980), James William (James, 1884), James Russell (Russell, 1980, 2003), Richard Lazarus (Lazarus, 1982, 1991), Klaus R. Scherer (Scherer, 1982a, 1982b), and Nico H. Frijda (Frijda, 1986, 1994, 2005).
- Thirdly, concerning the design and emotion aspect, the research includes Amic G. Ho (Ho, 2010; Ho & Siu, 2012), Lee Crossley (Crossley, 2003), Paul Hekkert and Pieter Desmet (Desmet, 2002; Desmet & Hekkert, 2009; Desmet et al., 2023). The study is situated within a university context and carries some educational implications; therefore, the literature is drawn from the work of Reinhard Pekrun (Pekrun, 2006; Pekrun et al., 2007; Pekrun et al., 2002a) and the design education understanding perspective of Donald Schön (Schön, 1987). However, education is not the focus of this research.

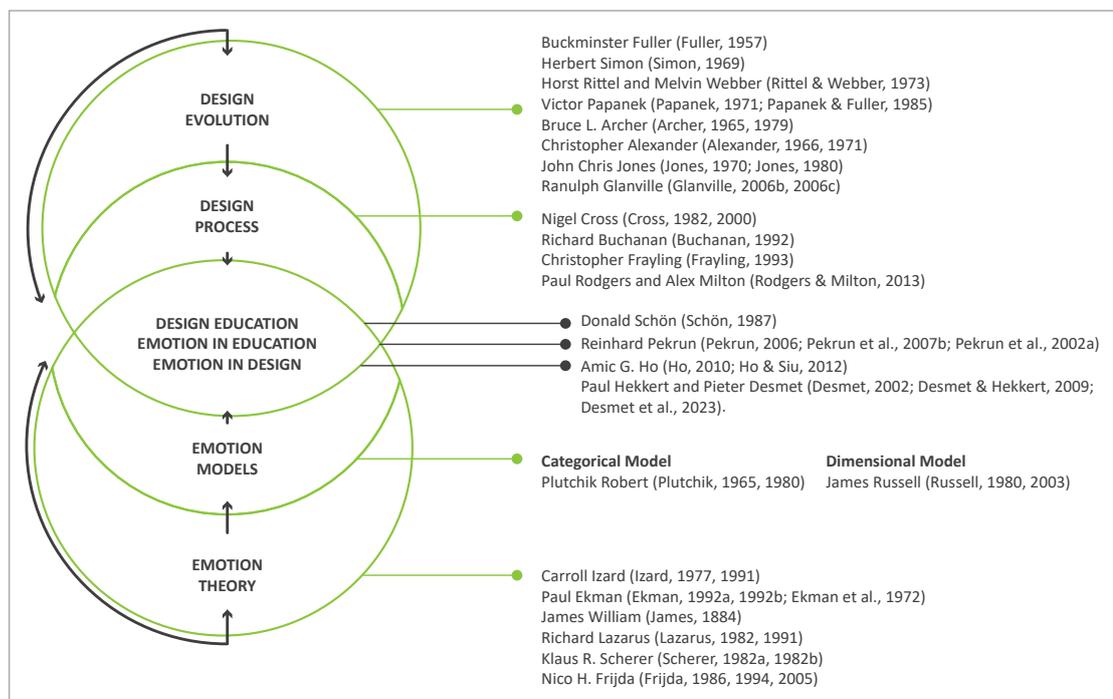


Figure 2-2. Thesis Main Contributors.

## 2.2 Design

### 2.2.1 What is Design?

A topic cannot be fully understood without considering its key terms. Therefore, it is essential to first explore the fundamental term 'Design' in relation to its early origin, its various linguistic dimensions, and the nature of its uses across different periods to arrive at its current state before examining the practical applications.

Tracing the history of the word 'design' explained that design existed before it was named, and even after the word appeared, design was first linked to artistic work before becoming a formal profession or academic field. A study by Côté-Real (2010) examines the linguistic evolution of the term 'design', tracing its origins to multiple sources that have influenced its meaning over time. The research highlights three key etymological roots: first, the Latin word 'designatio', as seen in Cawdrey's definitions, which originally referred to designation, planning, or appointing (Cawdry, 1970); second, the French word 'dessain', meaning drawing, which is evident in the annotations of Inigo Jones, who used 'designe' and 'desine' specifically to refer to the act of drawing rather than planning (Glanville, 2006a, 2006c); and third, the Italian word 'disegno', a term that carried both artistic and conceptual significance. 'Disegno' played the important role in shaping the modern understanding of design, as it represented not only the physical act of drawing but also the intellectual process behind artistic creation (Côté-Real, 2010). This integration of different linguistic influences contributed to the emergence of a more modern concept about design, one that extended beyond traditional definitions to embrace new characteristics of artistic production and professional practice. Moreover, the definition of design in relation to both art and science can be found in Bailey's *An Universal Etymological English Dictionary* (Bailey, 1763). The dictionary provides a comprehensive definition, tracing the word's origins through multiple languages, including French 'dessein', Italian 'disegno', Spanish 'desinio', and Latin 'designatio'. According to Bailey, design encompasses various meanings, including contrivance, enterprise, intention, invention, project, and the draught of a picture. Additionally, the verb 'to design' derives from the French 'dessiner', Italian 'disegnare', and Spanish 'designar', all of which emphasise the act of drawing a figure or sketch, planning, and forming an idea (Bailey, 1763). The dictionary also defines related terms such as 'designation,' meaning appointment, and 'designment', referring to a defining, intendment, or intention (Bailey, 1763). As a result, the word 'design' came to convey two primary functions. The first was to express a desire to change or shape things, reflecting an intention or purpose. The second was to describe a profession that utilises drawing as a fundamental tool within a project, integrating planning into a process (Côté-Real, 2010). The emphasis of the dual meaning of design can be found in the origin of the word in English and Latin, design is both a process of shaping the future (a project) and an activity that gives things meaning (distinguishing and organizing through signs) (Peruccio & Bistagnino, 2023). Based on these previous perspectives design can be understood as wishful planning or designation or project drawing (Côté-Real, 2010). Accordingly, Stevenson (2010) suggest that the term design has multiple meanings as both a noun and a verb, reflecting its broad application across disciplines. As a noun, design refers to a plan, drawing,

or blueprint created to illustrate the look, function, or structure of an object before it is made. It also encompasses the process of conceiving and producing such plans, whether for buildings, garments, or other artefacts. Additionally, design signifies the arrangement of features in a created object, the formation of decorative patterns, and the underlying purpose or intention behind an action, fact, or object. As a verb, design involves the act of deciding upon the appearance and function of an object by creating a detailed plan. Yet, design goes beyond functionality or aesthetics, positioning design as the practice of envisioning, planning, and shaping how a final outcome can take form and serve its intended purpose to be applied in the real world (Rushdie, 2021). Design also refers to the process of deliberate planning and execution with a specific purpose in mind. This highlights that design synthesises aspects, including insight, intuition and reason (Miller, 2004), which explain design as a process, not merely a product, and a successful completion of this process is essential in fulfilling the purpose. Furthermore, design can be defined as a process made up of overlapping activities that work together to generate original and meaningful ideas (Khasawneh, 2015).

However, while language has played a role in shaping the meaning of design, the overlap and ambiguity among these definitions have created confusion, making it difficult to define the fundamental essence of design clearly. An expanding perspective on design can also help shape how it is perceived and understood. Potter (1989) for example, emphasised the importance of specifying the use of the term based on a specific context, and he proposed a design through three key areas: the design of artefacts, the design of spaces, and the design of communication and messages. In relation to Potter's opinion, design tutors begin to emphasise students' capacity and conceptual possibility in developing processes by taking into consideration cultural diversity context (Haddad, 2013). Another approach comes from the emerging pluriverse design perspective, which aims to redefine sustainability beyond conventional frameworks, inspiring transformative actions towards ethical ecological futures designs (Escobar, 2011). Manzini (2015) discusses the reality of a changing world, both culturally and environmentally, which calls for a shift in mindset that moves away from the old belief that the world has no limits, toward a new understanding that recognises the planet's boundaries and the need for more sustainable ways of thinking and living. This shift has contributed to the emergence concepts of pluriverse design and design for transition, which gained momentum in recent years. These frameworks call for a fundamental shift away from dominant systems such as capitalism and industrialism, encouraging the creation of new ways of living and thinking in response to growing environmental and social crises (Escobar, 2018). This is the fact that can define design as "*Design research continues to involve rich, complex and layered practices that use creative practices to explore fundamental questions*" (Rodgers & Yee, 2023, p. 526).

Therefore, design is a process that navigates uncertainty, relying on decision-making to drive change and shape a better sustainable future (Cross, 2000, 2007). Design is guided by solutions developed through the designer's iterative process, which involves experimentation, trial, and error while considering functionality, aesthetics, and ethical requirements (Archer, 1965; Asimow, 1962; Glanville, 2006b; Jones, 1980; Simon, 1969).

In addition, Jobs (2000) stated, "*Design is the fundamental soul of a man-made creation that ends up expressing itself in successive outer layers of the product or service*". Yet, there is no universally agreed-upon definition of design (Ralph & Wand, 2009).

### 2.2.1.1 Design as Activity

Referring to previous definitions of design that highlights its fundamental role as a professional activity (Jonassen, 2008). Design is a divergent and convergent thinking activity (Cross, 1982). This activity encompasses two main aspects. First, design involves planning and creating with a future goal, integrating technical and functional elements to ensure effectiveness and coherence. Second, it incorporates symbolic elements that influence how people interpret and interact with designed objects, shaping their meaning and impact (Peruccio & Bistagnino, 2023). Asimow (1962) states that design, as an activity, involves deliberate thinking and planning before execution. He emphasised that design should be distinguished from making, which refers to the physical act of constructing or producing something, and from spontaneous activity, which involves actions carried out without prior planning or intent. Hence, even if the environment is not clearly defined, the design activity happened within a specific environment (Ralph & Wand, 2009). From these aspects, one can declare that design is an ongoing activity of defining an object's structure, starting when specifications begin and stopping when they end, with the possibility of resuming if modifications occur later.

Design aims at creating artefacts that facilitate change and improvement (Eckroth et al., 2007; Love, 2002; Simon, 1969). Therefore, the design activity includes conceptualising, framing, implementing, commissioning, and ultimately modifying, which helps in preparing alternative solutions in case needed (Freeman & Hart, 2004; Harris, 1995). Furthermore, design activity consists of various dimensions that interact dynamically. These dimensions include the design process, the designer, and the design problem, which together shape the development of design methods and tools (Figure 2-3) (Dorst, 2004; Roozenburg & Cross, 1991).

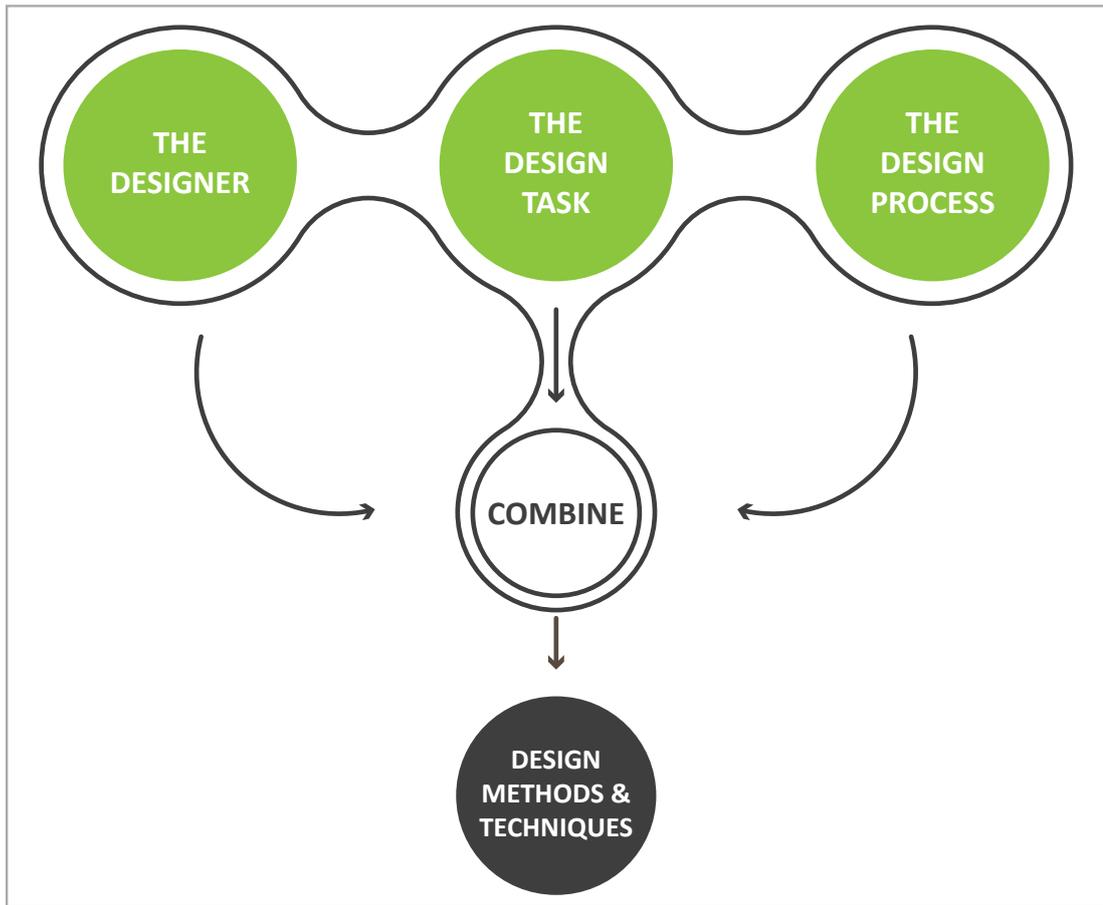


Figure 2-3. Design Activity Dimensions Representation after Dorst (2004) and Roozenburg and Cross (1991).

### 2.2.1.2 Design as a Process

Design is an action of creation, a mindset and a process (Miller, 2004) that shapes how designers understand, create, and solve problems, also known as a designerly way of knowing (Cross, 1982). Design is a systematic process that creates meaningful solutions through planning, adaptation, and execution (Archer, 1965). Asimow (1962) describes design as a process in which a goal is set, and means are adapted to achieve it, emphasising its purposeful nature. Walls et al. (1992) further compare the design process to the scientific method, highlighting that design, like a theory, consists of hypotheses that can only be validated by constructing the artefact. In contrast, Buchanan (1992) argues this idea by defining design as the human ability to conceive and realise products that serve individual or collective purposes. Hence, design is fundamentally a thought process that drives the creation of an entity. Papanek (1971) adds that design is both a conscious and intuitive effort to impose meaningful order, acting as both a guiding framework and a tool for structuring ideas. Pye (1964) further distinguishes design from invention, explaining that while invention is the discovery of a principle, design is the application of that principle to create a specific outcome. However, the design process applications are continuously expanding, as stated by Archer, *"There has been a worldwide shift in emphasis from the sculptural to the*

technological. Ways have had to be found to incorporate knowledge of ergonomics, cybernetics, marketing, and management science into design thinking" (1965, p. 57). A study by Auernhammer and Ford (2023), which analysed 77 related definitions of design found that 'process' is one of the most frequently mentioned terms highlighting that design is a sequence of actions taken to achieve a specific objectives. They further elaborate by suggesting that, in addition to being a process, design encompasses a set of specific activities that involve meaning-making and problem-solving.

According to Cross, "Design practice does indeed have its own strong and appropriate intellectual culture; we must avoid swamping our design research with different cultures imported either from sciences or art" (Cross, 2007, p. 46). Cross considers that the design process or practice includes epistemology, thinking, and behaviour. He regarded this practice as a sample with rituals and special connotations in comprehending, understanding, and conditioning in learning, in which it is not advisable to merge with other science or art samples in the research process. In relation to the design process, the term 'process' is an important aspect. Hence, Stevenson (2010) defines 'process' as both a noun and a verb, encompassing various meanings. As a noun, it refers to a series of actions taken to achieve a particular outcome or the natural growth of an organism. As a verb, it describes performing operations to alter or preserve something or move in a procession. These definitions underscore the fundamental components and sequence of a process: inputs, outputs, and intermediate steps (Figure 2-4), which describe the design function (Cross, 2000) and the designer as a black box (Jones, 1980). Inputs serve as the starting point, outputs represent the final result, and the intermediate steps, executed by designers, form the core of the process, guiding the process from initiation to completion. Hence, design is not a rigid step-by-step process but a fluid, iterative and dynamic set of activities (Lawson, 2004b; Miller, 2004).

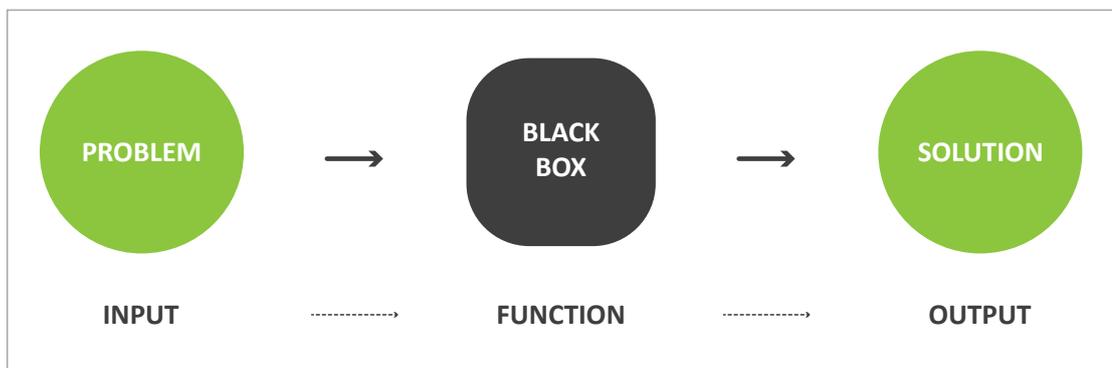


Figure 2-4. Designer Process as a Black Box Representation after Jones (1980) and Cross (2000).

These perspectives illustrate that design is both a transformative process that brings ideas to life, transforming abstract concepts into tangible outcomes, and a creative practice that uses its tools and language to shape these meaningful and functional solutions.

## 2.2.2 The Design Process Evolution and Frameworks

The design process follows specific practices, rituals, and meanings that shape how designers learn, understand, and approach their work (Cross, 2007). As a result, design researchers have taken different approaches to explain the various aspects of the design process, including exploring process management, methodology development, and procedure establishment, aiming to gain a deeper understanding of how it can be effectively employed (Best, 2006; Cross & Sivaloganathan, 2005; Peto, 1999). Thus, the design process and research has undergone various waves of development (Figure 2-5).

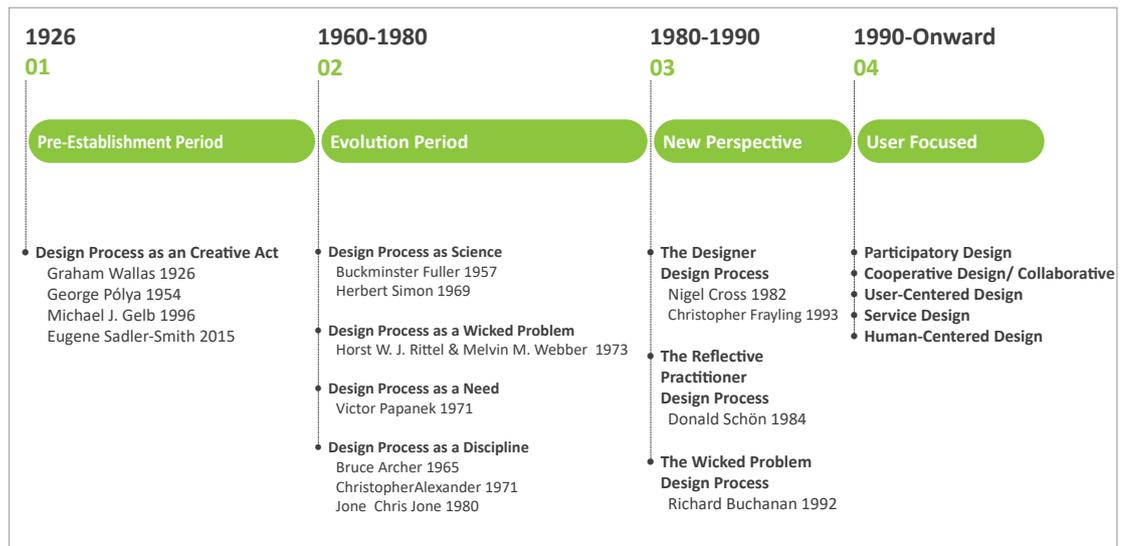


Figure 2-5. Design Research Timeline.

The beginning can be traced back to 1926 when the scientific explanation of thinking emerged (Wallas, 1926). Wallas introduced the four stages of the creative process: preparation, incubation, illumination, and verification. These stages were linked to three levels of consciousness proximity: non-consciousness, fringe consciousness, and full consciousness (Wallas, 1926). Sadler-Smith (2015) argues for an expanded framework with an additional stage called intimation, which serves as a transition between incubation and illumination. What is particularly interesting about this framework is the emotional link, as Wallas's framework was influenced by the works of Aristotle, James, Wundt, and Freud (Runco, 2014).

However, the 1960's through 1980's are considered significant periods of research on the design process development. The start was with the scientific and mathematical theories defining design as a structured process, ultimately recognising design as a form of science. Fuller (1957) proposed the design science planning process, including a set of principles aimed at guiding innovative thinking and problem-solving, particularly in the context of design and systems thinking. By applying scientific methods to design creation, he envisioned designers as a fusion of an artist, inventor, mechanic, objective economist, and evolutionary strategist. Accordingly, Simon (1969) in his book *The Science of the Artificial* described design

as a process and everything designed is an artefact intended to enhance the existing environment. Simon proposed that the most effective way to discover an optimal solution is through simulation or prototyping, stating, *“To understand them, the systems had to be constructed, and their behaviour observed”* (Simon, 1969, p. 20). Then, the basic structure of the design process was presented by Archer (1965) emphasising the systematic design approach. Conversely, a simplified version of the process as an analysis-synthesis-evaluation framework presented by Jones (1980) assured the rationality approach to help designers connect with human experiences. In agreement with Jones, Alexander (1971) argued for a shift away from viewing design as a systematic approach, encouraging a broader perspective that embraces rational thinking to complement intuition, helping designers understand perspectives and experiences beyond their own. Such perspectives and frameworks redefined how the design process is perceived, introducing methods, collaboration, and adaptability.

The shift from scientific to systematic to intuition-driven design methodologies has transformed the field, making the process more transparent and inclusive. Papanek (1971) integrated anthropology into the design practice, focusing on socially and ecologically responsible design processes. Papanek's ideas have profoundly influenced the design process by encouraging designers to adopt a more inclusive and sustainable approach and challenging them to move beyond aesthetics and functionality to consider social, environmental, and ethical implications in their work. Papanek's principles of socially responsible design were applied in collaborative projects making design a powerful tool for shaping the environment (Papanek, 1971). In addition, Rittel and Webber (1973) introduced the concept of 'wicked problems' to describe complex, ill-defined issues that resist traditional problem-solving methods. These problems lack definitive formulations, have no clear solutions, and are deeply interconnected with other issues, requiring iterative, adaptive, and participatory approaches to address them (Jonassen, 1997). In design, wicked problems concept are particularly relevant as designers who often deal with real-world challenges involving multiple stakeholders, conflicting values, and uncertain outcomes. Design processes should, therefore, realise the general and particular subject matter considerations to navigate the complexity and interconnectedness of such problems (Buchanan, 1992). These concepts regarding have profoundly influenced the design process and research methodologies.

A subsequent effort was conducted to investigate more deeply into design processes, focusing more on how designers generate unique ideas. The 1980s through 1990s are considered the second wave of the development of the design process. This period is characterised by a focus on how the design process is shaped by designers themselves, their intuition and thinking and the exploration of the role these aspects play in their design practice. Accordingly, Cross (1982) proposed 'Designerly Ways of Knowing', which distinguish designers from non-designers through their problem-solving processes. In addition, Cross's approach highlights the distinctions between art, design, and science by their unique characteristics. In science, objectivity, neutrality, and the pursuit of truth are paramount. On the other hand, the humanities are characterised by subjectivity, imagination, commitment,

and a focus on justice. Design, however, operates within a different framework, emphasising practicality, ingenuity, empathy, and concern for appropriateness (Cross & Sivaloganathan, 2005; Cross, 2007). This highlights the practical problem-solving nature of design, where the emphasis lies on creating solutions that are not only innovative but also suitable for the given context (Cross, 1982). It is worth mentioning that while Papanek (1971) considering the connection of thoughts and ideas that designers go through to create new ones is a process only, Cross (1982) view this ability as an inherent trait unique to designers (Galdon & Hall, 2022).

As a result, a continuation of the wicked problems concept was more acknowledged and this all goes to Buchanan (1992) publication 'The Wicked Problems in Design Thinking'. Buchanan redefines the design process as an adaptive, integrative, problem-solving discipline that deals with wicked problems through iterative, flexible approaches (Buchanan, 1992). He challenges linear design models, and advocating for continuous reframing, interdisciplinary collaboration, and dynamic problem-solving that provides a practical tool for designers to rethink these challenges to promote innovations (Earle & Leyva-de la Hiz, 2021). Ultimately, Buchanan envisions design as a liberal art essential for navigating technological, social, and cultural complexities in the modern world (Buchanan, 1992, p. 5). Another important perspective on the same period was proposed by Donald Schön in his book 'The Reflective Practitioner: How Professionals Think in Action' (1992b), which has had a profound impact on the design process by introducing the concept of reflection-in-action and enforcing the importance of reflective practice in professional work, including design (Dorst, 1995; Dorst & Dijkhuis, 1995). Schön critiques the traditional, technical-rational model of professional practice, which assumes that problems are well-defined and solutions can be derived from scientific knowledge (Cross, 1999). Instead, Schön argues that professionals, including designers, often face messy, complex, and uncertain situations that require adaptive, iterative, and reflective approaches (Earle & Leyva-de la Hiz, 2021).

Furthermore, Christopher Frayling's perspective on the design process challenges traditional research paradigms by arguing that design is inherently a form of research, yet, it does not always conform to conventional scientific or academic models (Frayling, 1993). He distinguishes between *research into design* (historical and theoretical analysis), *research through design* (experimental and process-driven inquiry), and *research for design* (gathering insights to inform creative practice) (Friedman, 2008). Frayling critiques the stereotype of designers as either intuitive artists or purely technical problem-solvers, instead positioning them as practitioners who blend systematic inquiry with tacit knowledge and iterative experimentation (Galdon & Hall, 2022). Following in the footsteps of Jones and Alexander, Frayling warns against forcing design research into rigid academic structures that priorities verbal outputs over practical exploration, advocating instead for a research culture that recognises design's unique way of generating and communicating knowledge through making (Galdon & Hall, 2019). By reframing the role of research within design, Frayling highlights the need for methodologies that validate the iterative, non-linear, and material-based nature of the design process.

After the 1990s, the contemporary understanding of the design process evolved, shaped by the foundational influences of the first and second waves of design research development. This period played a role in solidifying design as a distinct discipline, moving beyond a singular approach to embrace more specialised frameworks. As design matured, it became evident that different sub-disciplines within design—such as industrial design, product design, graphic design, interaction design, and service design—required unique methodologies tailored to their specific needs (Bremner & Rodgers, 2013). This era saw the differentiation and formalisation of design processes, recognising that each sub-discipline operates within its own principles and problem-solving approaches while still being interconnected within the broader field of design.

Due to the growing interest in the design process, its popularity has rapidly expanded over a short period. In this section, a highlight of key trends and design researchers' process frameworks to gain a deeper understanding of the focus each design process considers. Based on previous discussions, these frameworks are categorised into three main phases according to their time period: the Pre-Establishment Period (1926), the Evolution Period (1960–1980), and the New Perspective Period (1980–1990).

### *2.2.3 Pre-Establishment Period (1926)*

This period is mainly led by the key figure Graham Wallas, whose expertise was social psychology, the study of how thoughts, feelings, and behaviours of individuals are influenced by social situations. Wallas published his last major work, *The Art of Thought* (Wallas, 1926) aiming to uncover the 'natural thought process' of creativity and teach it to others. The beginning was by introducing the problem-solving aspect as one of the essential functions of the individual brain (Wang & Chiew, 2010). Wallas viewed the problem-solving procedure as a process (Auernhammer & Ford, 2023; Bonnardel et al., 2018) that includes four stages: preparation, incubation, illumination, and verification (Philip, 2015; Pühringer, 2018; Sadler-Smith, 2015). An important aspect of Wallas' framework is the connection to the scientific clarification of thinking and the emotional links it holds by incorporating concepts from psychology and emotion within the theory structure (Sadler-Smith, 2015). Related to what is explored in various research, the design process follows distinct stages. Wallas' begins with preparation, the initial phase where information is gathered and the problem is defined. Next is incubation, a phase characterised by unconscious processing, where ideas and associations form without deliberate effort. The third stage, illumination, marks the moment when a sudden insight or solution emerges and is consciously recognised. Finally, in the verification stage, the solution identified during incubation undergoes evaluation and refinement to ensure its effectiveness (Bonnardel et al., 2018; Sas & Zhang, 2010; Wang & Chiew, 2010). Sadler-Smith (2015), building on Wallas (1926) framework, proposed the addition of the intimation stage as a linking phase in the creative process (Figure 2-6). This stage represents a state of background awareness, where subconscious insights emerge even though they are not the primary focus of attention. Despite being on the periphery of conscious thought,

these insights remain highly relevant to the current problem, guiding the transition toward the next stage of creativity.

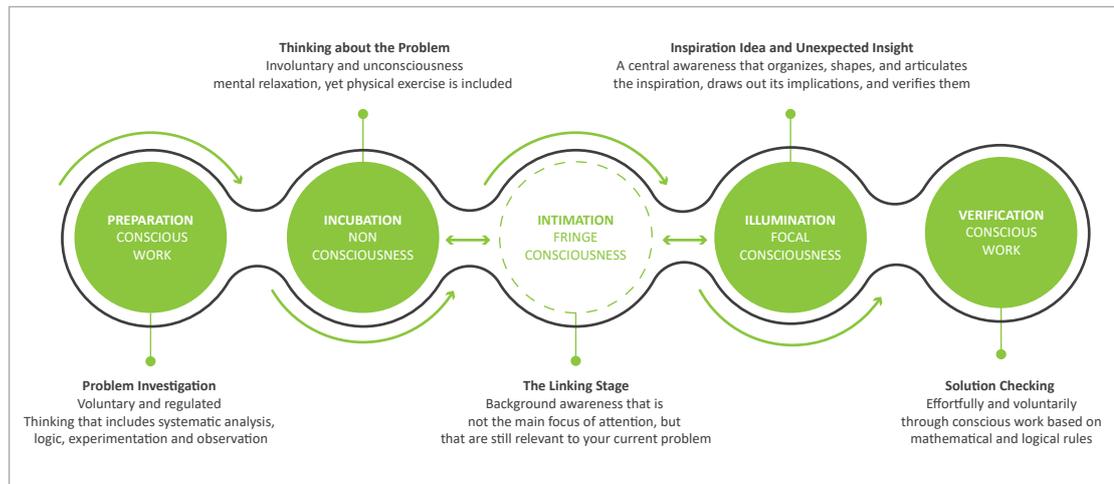


Figure 2-6. Design Process Framework and the Grades of Consciousness Representation after Wallas (1926) and Sadler-Smith (2015).

Over time, other researchers have built upon Wallas's framework, introducing their own perspectives and modifications. For instance, Polya (1954) developed a four-stage model consisting of: understanding the problem, devising a plan, carrying out the plan, and looking back to reflect on and evaluate the process (Wang & Chiew, 2010). Similarly, Gelb (1996) proposed a five-stage process that includes preparation, generation, incubation, evaluation, and implementation (Philip, 2015). These adaptations reflect the evolving understanding of the design process, demonstrating how different disciplines and researchers interpret and refine Wallas's foundational model to suit various problem-solving and design contexts.

### 2.2.4 Evolution Period (1960–1980)

This period marks the beginning of defining design as a distinct field with its own identity and terminology. A pivotal moment in this development was the Conference on Systematic and Intuitive Methods in Engineering, Industrial Design, Architecture, and Communications, held in London in 1962 (Jones & Thornley, 1962). This conference opened a broader debate on the design process, bringing attention to both systematic and intuitive approaches (Di Russo, 2016). The discussions and insights from this event later contributed to establishing the Design Research Society in 1966, which focused on studying the process of designing among the various design fields, further solidifying design as a recognised field of study and practice (DRS, 2024). The Evolution Period can be categorised into four focal concepts:

- Design Process as Science,
- Design Process as a Wicked Problem,
- Design Process as a Need, and
- Design Process as a Discipline.

### 2.2.4.1 Design Process as Science

This category is highlighted first by the work of Buckminster Fuller (1957), particularly through his concept of Comprehensive Anticipatory Design Science, which was employed extensively in both his writings and teachings. Fuller approached design from a scientific and system thinking perspective, arguing that design should be proactive, forward-thinking aimed at solving global challenges. His work advocated for design as a science, and he believed that by applying a holistic, anticipatory approach, designers could address needs rather than reacting to problems after they arise. This philosophy was deeply embedded in the Creative Engineering Laboratory, where Fuller developed and taught his course, encouraging students to think beyond conventional design methods and adopt a systems-based approach to innovation.

Figure 2-7 outlines Brown et al. (1975) The Design Science Planning Process, influenced by Fuller's (1957) comprehensive anticipatory design science framework, which presents a systematic approach to addressing environmental and social challenges through design planning. The structured, systematic design process begins with choosing a problem situation and defining the key problems to address (Gano, 2015). Once the challenges are identified, the process moves toward defining a preferred state and envisioning the desired outcome. The present state is then analysed to understand existing conditions and evaluation criteria are developed to assess potential solutions. From here, the process involves inventorying alternatives and designing a preferred system that aligns with the desired objectives. After the system is designed, implementation strategies are formulated to ensure practical execution. The entire process is then documented, serving as a reference for communication and refinement. Finally, the process extends beyond its initial scope by leading to the development of artefacts, communication of the plan, and integration into a larger planning process, ensuring sustainability, scalability, and continuous improvement (Brown et al., 1975). Each stage builds upon the previous one, ensuring a logical and effective progression from problem identification to solution implementation.

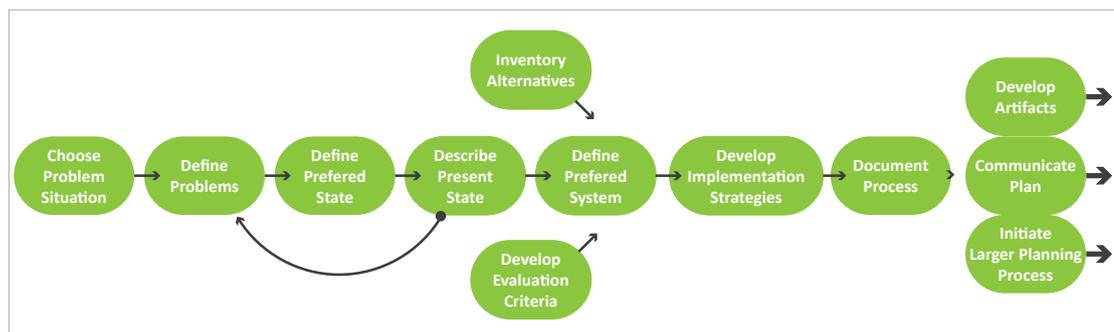


Figure 2-7. The Design Science Planning Process Representation after Brown et al. (1975).

Similarly, Herbert Simon, in *The Sciences of the Artificial*, defines design as a systematic process aimed at transforming artificial environments into preferred outcomes, emphasising its role across disciplines such as engineering, medicine, and policy science (Simon, 1969). He argues that the artificial world, constructed by humans, reflects the limitations of human

cognition, which in turn shapes the boundaries of problem-solving (Asemi et al., 2011). Figure 2-8 illustrates Simon's decision-making process, outlining four main stages (Simon, 1977, 2013). Initially, Simon introduced three key stages, with the fourth stage being added later to refine and expand the framework (Cerejo & Carvalhais, 2020). The process begins with:

- The intelligence stage is where the problem is observed, understood, and defined by gathering relevant information.
- The design stage involves identifying variables, criteria, and relationships between different factors while developing alternative solutions and decision models.
- The choice stage alternatives are evaluated, and the most suitable decision is selected based on the established criteria.
- The implementation stage ensures the decision is employed, considering its consequences, securing necessary resources, and developing a concrete execution plan.

In contrast to Fuller's process approach, Simon's process is iterative, allowing feedback loops between stages to refine and adapt decisions as new insights emerge, reinforcing the process application in complex, dynamic environments (Phillips-Wren, 2013).

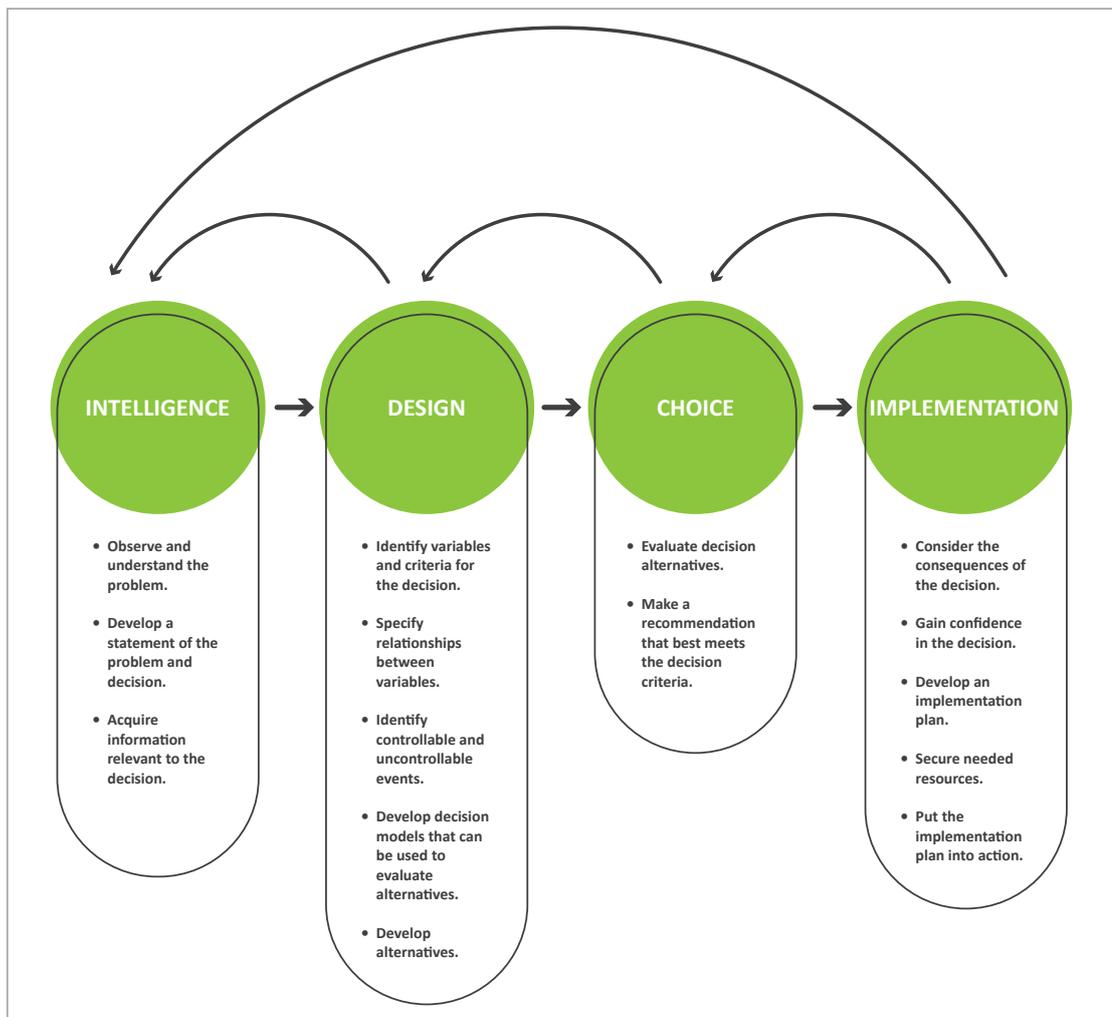


Figure 2-8. The Decision-Making Process Representation after Simon (1977, 2013).

Simon's framework proposes that design often involves 'satisficing', finding satisfactory rather than optimal solutions, due to the complexity of external environments and cognitive constraints (Asemi et al., 2011; Simon, 1969). He advocates for prototyping and simulation as methods to generate knowledge and address poorly understood systems, aligning with his belief that understanding complex systems requires constructing and observing their behaviour (Edelson, 2002). Furthermore, Simon highlights the importance of representation and shared understanding in large-scale societal design, stressing that cooperation and evolving processes are essential for addressing complex, boundary-defined problems (Di Russo, 2016). Ultimately, Simon's work showed the need for a design science grounded in logic and simulation to navigate the intricacies of the artificial world.

#### 2.2.4.2 Design Process as a Wicked Problem

In their work, *Dilemmas in a General Theory of Planning*, Rittel and Webber (1973) introduce the concept of 'wicked problems', which are characterised by their uniqueness, ambiguity, and lack of definitive solutions, contrasting them with 'tame' problems that can be resolved through scientific methods (Buchanan, 1992). They argue that indeterminate problems, often found in policy planning and complex environments, cannot be solved but only resolved through iterative processes, with solutions judged as better or worse rather than true or false (Buchanan, 1992; Cao & Protzen, 1999). This concept partially aligns with Simon's theory of satisficing, as both consider the limitations of achieving optimal solutions in complex, open-ended scenarios (Lawson, 2004b; Simon, 1969). Furthermore, this design process highlights the co-evolution of problems and solutions, stressing that understanding the problem depends on the proposed solution and vice versa (Rittel & Webber, 1973). Their work has profoundly influenced design theory, providing a framework for addressing ambiguity and complexity in design practice, and continues to resonate with contemporary scholars who wrestle with the evolving nature of wicked problems in large-scale and real-world contexts (Coyne, 2005; Jonas, 2007).

Given that, the Issue-Based Information System (IBIS) process (Figure 2-9) presents a structured approach for addressing complex, wicked problems in design and planning. The framework is organised around three primary elements (Rittel & Webber, 1973):

- Issues represent the central questions or problems being addressed.
- Positions are the proposed solutions or responses to these issues.
- Arguments provide the reasoning that either supports or objects to the positions.

The relationships between these elements are defined by rules such as 'responds-to', 'supports', and 'objects-to' (Kunz & Rittel, 1970), which help clarify the logical flow of the discussion. For example, a position 'responds-to' an Issue, while an argument may 'support' or 'object-to' a position. This framework presents the iterative and dialogical nature of problem-solving, where solutions are not definitive but are evaluated instead. The IBIS framework has been widely adopted in design theory and practice for the ability to structure complex, ambiguous problems and facilitate collaborative decision-making.

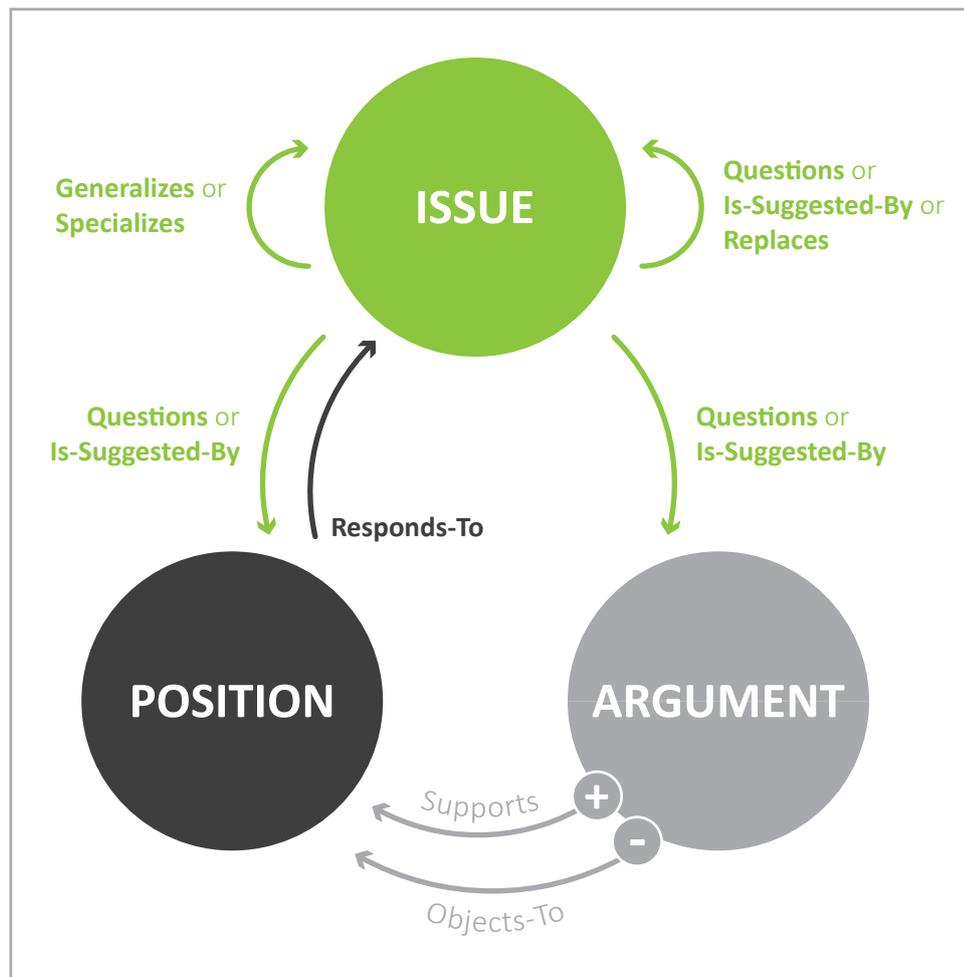


Figure 2-9. IBIS Process Representation after Kunz and Rittel (1970).

### 2.2.4.3 Design Process as a Need

Victor Papanek's *Design for the Real World* book (1971) introduces a moral dimension to design, establishing the designer's responsibility to address genuine human needs rather than fleeting desires. Unlike Rittel, Webber, and Simon, who focus on process theories and methods, Papanek prioritises innovation through simplification, advocating for solutions that reduce complexity to its simplest form. He underscores the intuitive nature of design, describing it as *"The conscious and intuitive effort to impose meaningful order"* (Papanek, 1971, p. 4), while acknowledging the challenges of quantifying intuition. Papanek's approach contrasts with Simon's optimisation and Rittel's wicked problems. Instead, he relies on experience, knowledge, and analogical thinking to generate innovative solutions (Di Russo, 2016). By integrating traditional methods like the function complex and brainstorming techniques, Papanek provides a practical design process framework for balancing tangible outcomes with ethical considerations, ultimately advocating for a design practice that serves social well-being over profit-driven motives.

The Function Complex (Figure 2-10), as conceptualised by Victor Papanek, provides a framework for understanding the multifaceted nature of design, encompassing six interconnected categories:

- Method, which includes tools, materials, and processes;
- Use, which highlights design's roles as a tool, a form of communication, and a symbol;
- Association, which considers the influence of family, environment, and culture on design;
- Telesis, which examines the design's impact on nature, society, and technological progress;
- Aesthetics, which focuses on gestalt, perception, and innate human factors;
- Need, which addresses fundamental human requirements such as survival, identity, and goal formation (Papanek, 1971).

By integrating practical, aesthetic, and moral dimensions, the Function Complex framework advocates for a design practice that is both innovative and socially responsible, aligning with Papanek's vision of design as a force for meaningful and sustainable change.

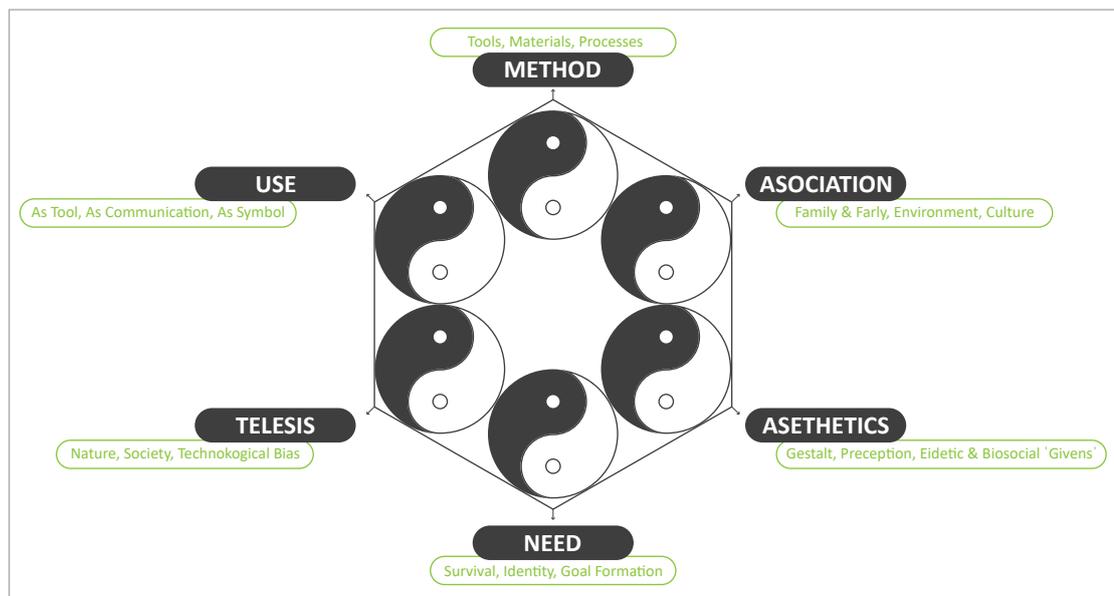


Figure 2-10. The Function Complex Process Representation after Papanek (1971).

#### 2.2.4.4 Design Process as a Discipline

Jones (1980) proposed a simplified fundamental approach to the design process to bring the rationality and intuition to understanding the design problem as the most crucial aspect of the entire process. His design process consists of three key stages (Figure 2-11):

- Analysis begins when the designer identifies and organises requirements, creating a structured list that refines and clarifies the problem. This stage ensures that all necessary specifications are logically defined before moving forward.
- Synthesis is based on the established requirements; the designer develops solutions for each criterion while minimising compromises. This stage focuses on generating design alternatives that best meet the identified needs.
- Evaluation in which the proposed solutions are assessed for their accuracy and feasibility, considering aspects such as functionality, manufacturability, market viability, and operational effectiveness. Only after this thorough evaluation does the design move forward to final production.

This framework introduces the design process not as linear, but as an iterative process of divergence, transformation, and convergence, that played a role in shaping design not only as a practice but as a research-based approach.

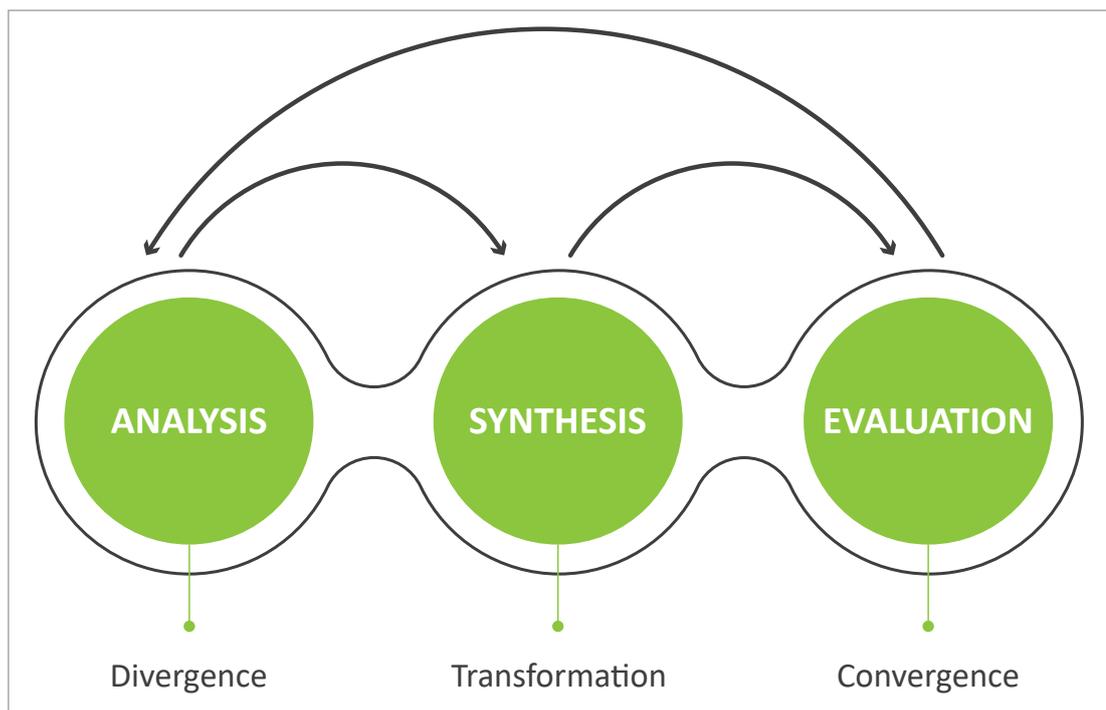


Figure 2-11. Designing as a Three-Design Process Representation after Jones (1980).

Following Jones, Archer's contribution to design theory and education was foundational in establishing design as a distinct academic discipline, separate from the sciences and humanities. As opposed to Jones, he pointed out the systematic nature of the design process,

defining the process as a goal-directed activity that balances creativity with purpose and human values with optimisation (Archer, 1965). Archer's early articulation of design thinking, which integrated fields like ergonomics, cybernetics, and management science, foreshadowed the interdisciplinary approach characterising contemporary design practice (Archer, 1965). His recognition of design problems as complex and his advocacy for a holistic, human-centred approach anticipated later discussions on wicked problems and design management (Archer, 1965, 1979). Despite later reflecting on the limitations of applying operational research methods to design, Archer maintained that design is an essential third area of education, focused on the making and adapting of human surroundings to meet material and spiritual needs (Archer, 1979).

Archer's design process presents a structured framework, emphasising a logical approach to problem-solving, much like Jones' (1984) framework, yet more detailed. Both approaches focus on generating multiple solutions before selecting the best alternative. As illustrated in Figure 2-12, Archer's design process consists of three main stages: the analytical phase, the creative phase, and the executive phase (Buchanan, 2015). However, within these stages, the process is further divided into six key design activities as follows (Archer, 1965):

- Programming is the starting point where the design issue is identified and an action plan is established.
- Data collection involves the gathering, classification, and organisation of relevant information to support the design process.
- The analysis phase examines the collected data to pinpoint the core problem, leading to the formulation of a structured design specification.
- Synthesis occurs when designers develop a design proposal, exploring solutions based on the previously identified criteria.
- The development phase involves constructing prototypes and testing the criteria to refine the design and ensure its feasibility.
- The communication phase prepares the final design for manufacturing and production, ensuring all details are effectively conveyed (Archer, 1965).

Notably, Archer's process is not linear; it incorporates multiple feedback loops, allowing for iteration and refinement at various stages. This adaptive and iterative nature ensures continuous improvement and optimisation of the design before it reaches the final execution phase. Archer's work remains a cornerstone of the design process, offering a framework that bridges methodologies and human values in the pursuit of meaningful solutions (Cross, 2000). To describe his design process approach, Archer stated, "*The range of techniques and disciplines which might be employed at various stages in the conduct of a design project are referred to only in general terms. Different design problems, and different classes of design activity, call for different techniques and different emphases at various stages. There is no suggestion here that all design should be conducted according to a given formula - only that the logic of any design problem may be better perceived against the background of a common framework*" (Archer, 1968, p. 5).

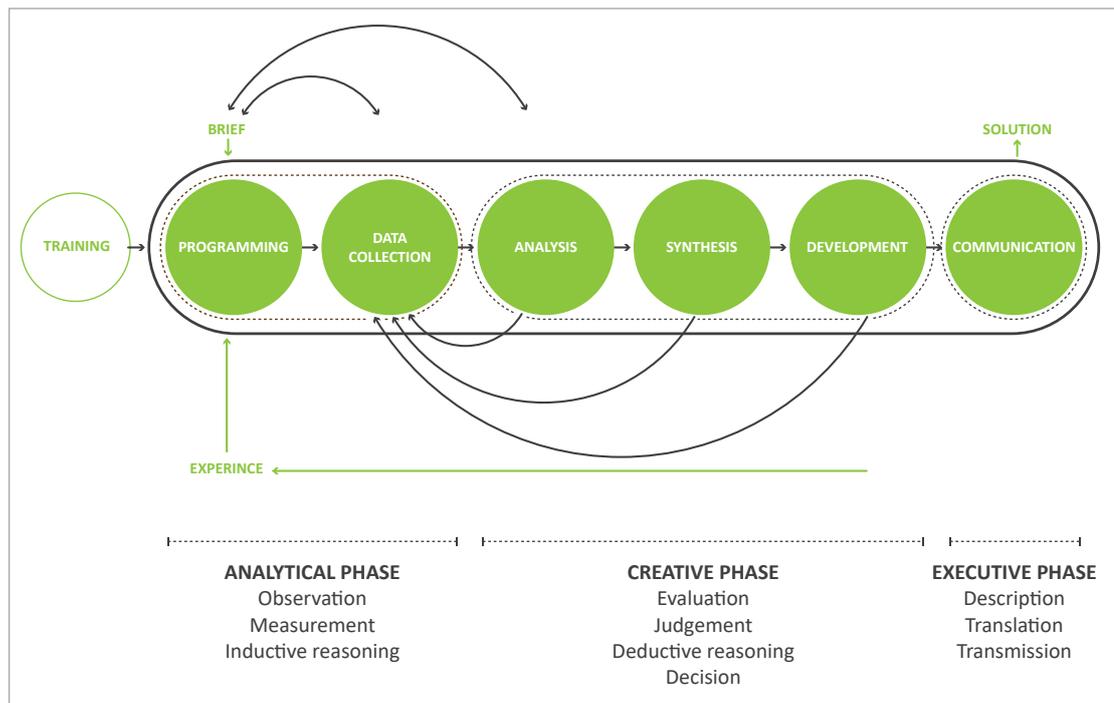


Figure 2-12. Design Process and the Three-Phase Representation after Archer 1965.

## 2.2.5 New Perspective Period (1980–1990)

This period emerged as a response to the rejection and re-evaluation of the design process as defined by previous researchers. Rather than emphasising the role of science throughout the entire process, there was a significant shift toward focusing on the designer themselves, their thinking patterns, problem-solving approaches, and decision-making processes. This era marked a revival of efforts to understand design from a fresh perspective, exploring it not just as a structured methodology but as an intuitive, cognitive, and human-centred process. This period is categorised into three key perspectives based on its main contributors:

- The Designer Design Process,
- The Reflective Practitioner Design Process, and
- The Wicked Problem Design Process.

### 2.2.5.1 The Designer Design Process

Considering the designer to be the heart of the design process Cross's (1982) work considers a continuation of Archer's (1979) systematic perspective but with more emphasis on the intuitive nature of the design practice, arguing that the design process is a unique process of solution generation that does not need to mimic the methods of science or art (Dorst & Cross, 2001). Cross highlighted the importance of understanding how designers think, focusing on the 'process as bridges' that connect ideas rather than the 'process as leap' (Cross, 1992), and agreeing with Wallas (1926) importance of the illumination stage during

the design process that underscored the role of analogical thinking in the design process. Cross's perspective sees design as a human activity that employs the highest cognitive skills to synthesise, create, and solve problems (Cross, 1992; Cross et al., 1997). By acknowledging the contributions of earlier design researchers, Cross helped to consolidate design as a field with its own intellectual culture, methods, and processes distinct from other disciplines. His work continues to influence contemporary design research, providing a foundation for understanding the complexity and uniqueness inherent in design practice.

Cross's (2000) design process framework illustrates that the iterative design process consists of two main strategies, divergence and convergence, yet the process is goal-oriented; it seeks a definitive outcome rather than endless exploration. However, before the completion, the design must go through a final stage where the selected idea is evaluated and tested for effectiveness, functionality, or aesthetics and is detailed and refined to ensure precision, clarity, and feasibility for implementation (Hu et al., 2019). Figure 2-13 illustrates Cross's frameworks. A simple aspect of the design process is based on the design activities designer went through which follows a structured yet iterative approach consisting of four key stages (Cross, 2000):

- The Exploration that involves researching and understanding the ill-problem space where designers gather information, define constraints, and explore possibilities before moving forward.
- The Generation in which designers develop multiple ideas and concepts based on their exploration. It is the stage where various potential solutions are formulated.
- The Evaluation of the generated ideas is based on criteria such as feasibility, effectiveness, and relevance to the design challenge and brief. Notably, this phase includes feedback loops, where other significant ideas arise and might require a return to the generation phase for further refinement.
- The Communication comes once a viable design solution is selected and ready to be manufactured. This step ensures that the design is clearly presented for implementation, collaboration, or further development.

The presence of a feedback loop suggests that the process is not strictly linear but iterative, allowing for continuous refinement and improvement before finalising the solution. This process reflects Cross's emphasis on design as a problem-solving activity that evolved based on ill-defined problem-solving and iterative nature (Cross, 2000). Moreover, the process highlights the designer's use of divergence and convergence strategies. It begins with an open phase of research and exploration, which serves as a vital element of the design process and significantly shapes the final outcome. During the divergent phase, a more mental and intuitive approach comes into play, aiding in refining ideas, narrowing down options, and facilitating decision-making (Shah et al., 2012).

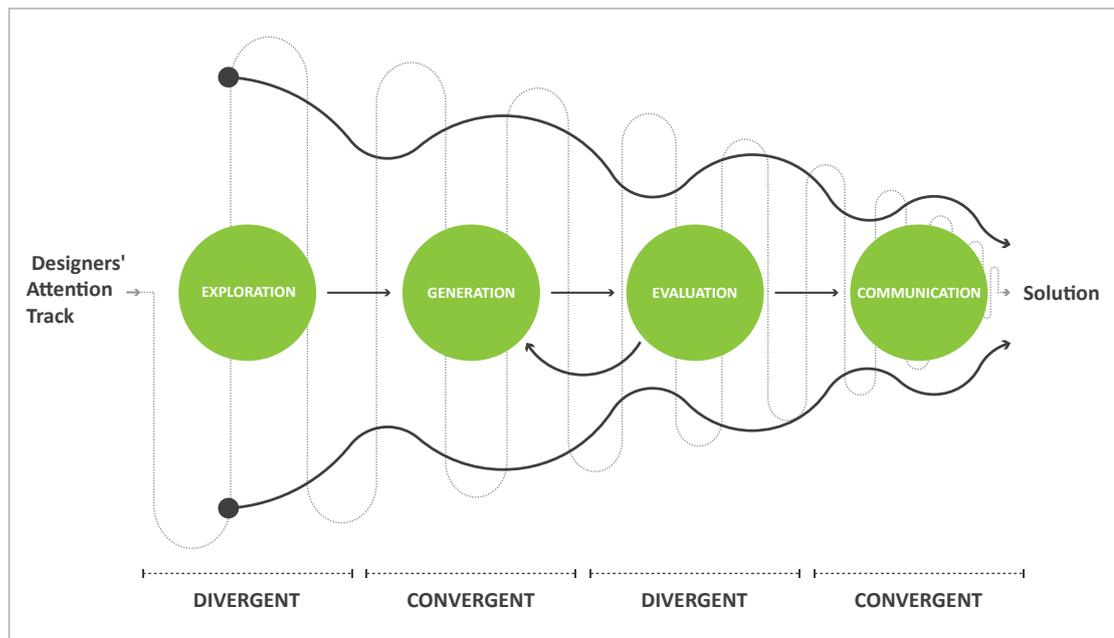


Figure 2-13. Four Stage Design Process Representation after Cross (2000).

### 2.2.5.2 The Reflective Practitioner Design Process

As a continuous effort to evaluate and criticise the previous design process, Schön's (1992b) reflective practice approach revolutionised design theory by shifting the focus from problem-solving to problem-framing and iterative learning. He argues that designers actively construct their problem space rather than finding solutions to predefined problems. By challenging Simon's (1969) scientific approach to design, Schön argues that design problems are often ill-defined, rarely given in a fully formed state, and cannot be addressed through rigid, scientific methods alone. This argument aligns perfectly with Rittel and Webber's (1973), Cross's (1982), and Buchanan's (1992) perspectives.

Schön affirms the problem-setting, problem-framing, and the continuous interplay between thought and action by introducing his process framework's three key concepts (Figure 2-14):

- The knowing-in-action stage refers to the accumulated spontaneous knowledge gained through years of experience and training. allowing practitioners to act instinctively without requiring deep deliberation. and relies on the automatic application of expertise to navigate specific situations effectively.
- Reflection-in-action, on the other hand, occurs during the practice itself, where designers actively use their knowledge and past experiences to assess and respond to the current situation in real time. This involves analysing relevant information and making informed decisions as the problem unfolds.
- Reflection-on-action takes place after a decision has been made and a solution has been implemented. It is a deliberate process of reviewing and understanding the

reasoning behind the decision, identifying lessons learned, and considering how future situations can be handled more effectively. This stage adds meaning to experience, fostering continuous learning and improvement in professional practice (Schön, 1987).

In this process, designer expertise is demonstrated through practice rather than verbal articulation and a process of framing and reframing shapes the way a problem is perceived and approached. These concepts highlight the ways in which designers engage with uncertainty and emergent complexities in their processes (Visser, 2010). This process allows for new insights to emerge dynamically as designers interact with materials, tools, and constraints in the design situation (Schön, 1987, 1992a).

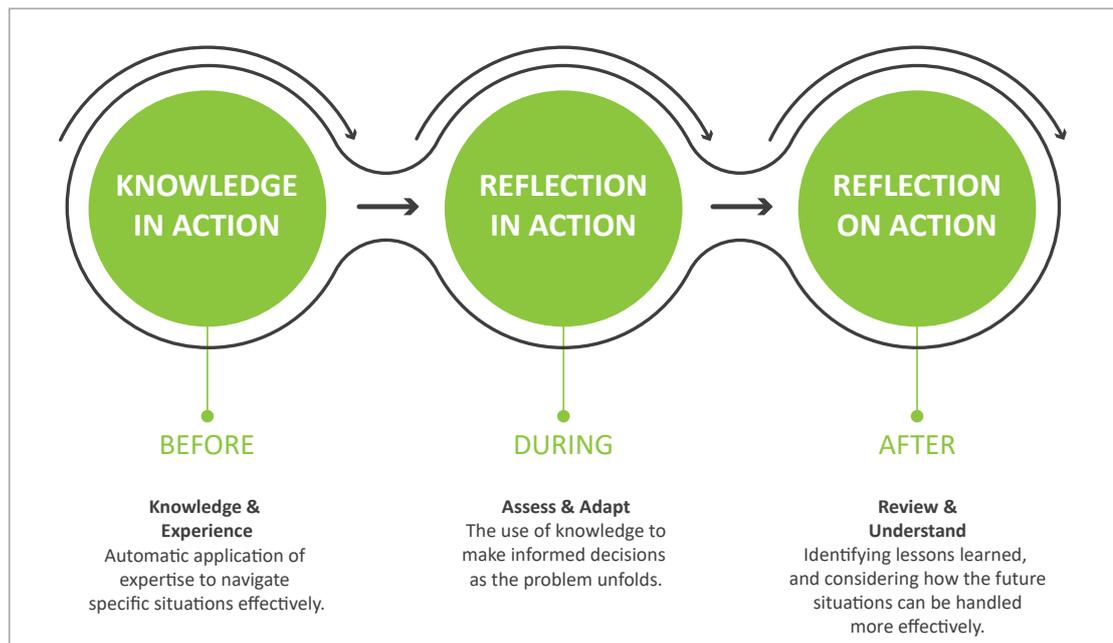


Figure 2-14. Reflective Practitioner Process Representation after Schön (1984).

Schön's work aligns with Rittel and Webber's theory of wicked problems, but he elaborated more by focusing on the designer's internal, reflective dialogue with the problem and the design object, highlighting the importance of personal experiences in shaping the designer's design process and practice (Schön, 1987).

### 2.2.5.3 The Wicked Problem Design Process

Wicked Problems in Design Thinking paper by Richard Buchanan (1992) redefines the design process as a liberal art with an interdisciplinary nature and the potential to address complex, wicked problems through innovative and integrative practices (Buchanan, 1992). As a design researcher in this period, Buchanan critiques the scientific approach of first-generation theorists; instead, he positions design as a profession combining theory and practice to enrich human life (Buchanan, 1992). He argues that design is a skill mastered by

few, capable of generating innovation through the repositioning of ideas, highlighting Cross's bridging concept, Schön's emphasis on problem framing (Buchanan, 1992) and Rittel and Webber's design problem uniqueness.

Buchanan's significant contribution is his framework of the four orders of design practice (Figure 2-15), which distinguishes between four design areas within a structured framework for understanding the expansive and adaptable nature of design practice (Buchanan, 1992, 2015). These areas include:

- Designing symbols, including visual communication.
- Designing objects includes the appearance and construction of the physical aspect.
- Designing activities, services, and processes, including the interaction and integration of management, planning, and experiences.
- Designing systems, organisations, and environments, including meeting, learning, and exploring people and environment needs (Wang et al., 2024).

These orders represent different phases of the problem field, guiding designers from idea generation to evaluation. The four key phases follow a logical progression of thought and action as follows:

- Invention is where new ideas emerge by challenging existing norms and exploring innovative solutions.
- Judgment involves assessing feasibility, ensuring that ideas align with realisation, desirability (meeting user needs), and long-term viability and sustainability.
- Connection and Development focuses on refining and prototyping the design, ensuring it is functional, user-friendly, and desirable.
- Integration and Evaluation examines the broader impact of the design, evaluating its alignment with organisational goals, user needs, and societal implications.

This structured approach ensures that design solutions are thoughtfully developed, tested, and assessed before implementation (Buchanan, 2015). This perspective guided the application of the design process across the diverse fields of contemporary design.

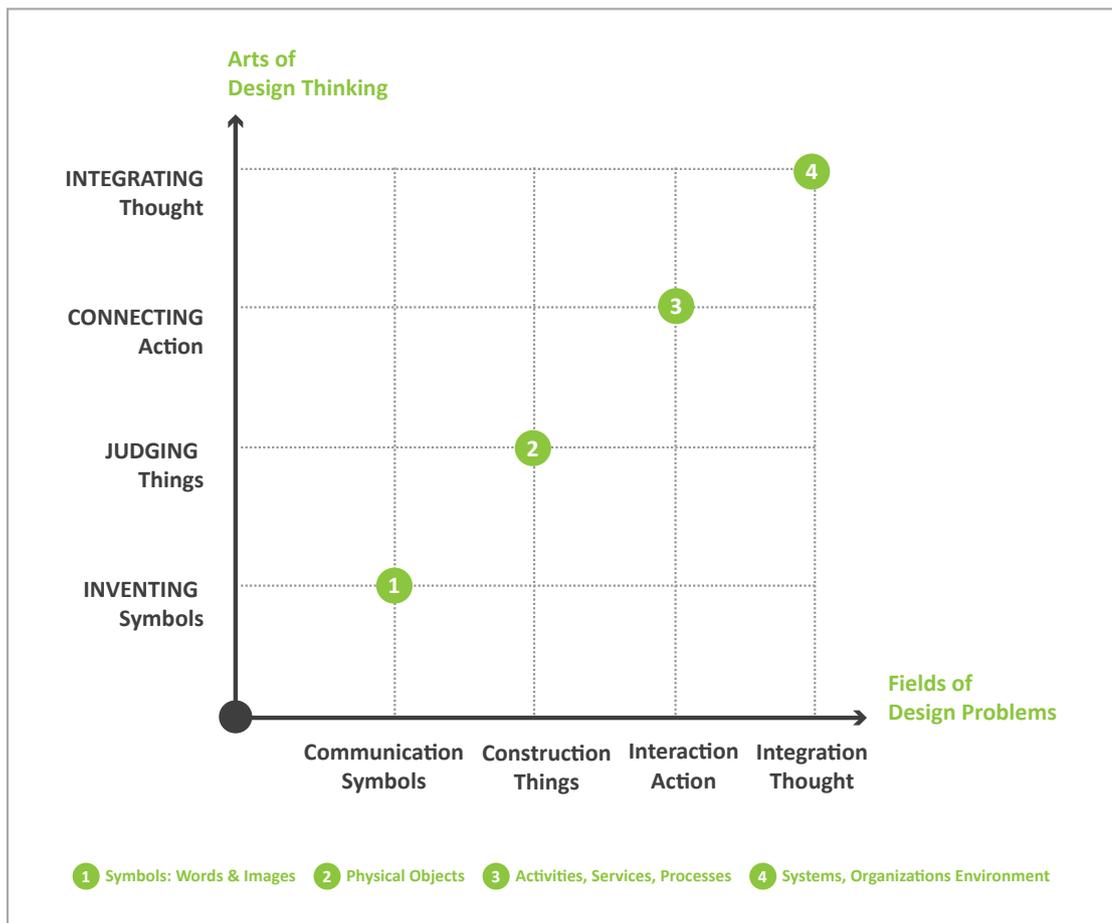


Figure 2-15. The Four-Order of Design Representation after Buchanan (2015).

### 2.2.6 1990-Onward

After the three main periods of design process evaluation and development, the Design Thinking Research Symposium in 1991 (Cross, 2018) came as an important step that highlighted design research to inform both design education and practice. The shared design task theme of the symposium shows the importance of observing, allowing the opportunity to analyse the design process more efficiently (Rodgers, 2013). Moreover, understanding performance in design has been integrated into educational curricula to better cultivate design skills, dynamics (Cross, 2004) and critique sessions among students (Adams et al., 2016). Thus, the design process follows specific practices, rituals, and meanings that shape how designers learn, understand, and approach their work (Cross, 2007). After that, various design processes were developed across many diverse disciplines.

The rapid development of the design process has been shaped by a series of evolving processes that place users and stakeholders at the core of the design process. Participatory Design emerged as an early approach that actively involved users in the design process, ensuring that their voices and needs were directly integrated into decision-making and originated in the Scandinavian works (Spinuzzi, 2005). This later evolved into Cooperative

Design, also known as Collaborative Design, which considers collaboration between designers and users and fosters a more dynamic and inclusive design environment (Holmlid, 2009; Kvan, 2000). As technology and user expectations advanced, User-Centred Design (UCD) gained prominence, shifting the focus toward designing solutions that prioritise usability, accessibility, and overall user experience (Norman, 2013). Building upon these principles, Service Design extended the design scope beyond products, addressing complex systems and interactions to enhance user experiences in services. Eventually, this led to the development of Human-Centred Design (HCD), a broader framework that integrates empathy, interdisciplinary collaboration, and iterative problem-solving to create solutions that deeply resonate with human needs (Rouse, 1991). These progressive shifts in design methodology highlight a growing focus on inclusivity and co-creation that includes more than human design aspects, and the continuous adaptation of design processes to address evolving social and technological challenges.

However, this research will not discuss these design processes. Instead, the design process developed by Milton and Rodgers (2013) will be the focus of the study. They proposed that design research explores the design process across various fields, aiming to understand and improve design methodologies, products, services, and systems, aligning with Buchanan's (2015) perspective and approach to the design process (Figure 2-16). Design research has evolved into three primary forms: research into and about design, research as design, and research through design, corresponding to Frayling (1993) classification. The first, research into and about design, is the most established and involves historical, theoretical, and contextual analysis, where the researcher critically evaluates existing design work from an external perspective. Research as design considers the creation of designed objects as a form of research where knowledge is embedded in the artefacts, though it may not always contribute to knowledge in the traditional academic sense. Lastly, research through design involves experimental, practice-based inquiry, integrating both practical creation and critical reflection, often interdisciplinary in nature. This approach generates new knowledge through the interaction between artefacts and reflective analysis, offering insights that are both internal and external to the design process. Despite some overlaps, these three categories distinguish the different ways design research contributes to advancing knowledge. Given that, the framework introduces a comprehensive design process that integrates key elements from previous design research, drawing upon insights from established methodologies. By synthesising aspects from prior studies, it provides a unified approach that acknowledges the evolution of the design process while addressing contemporary challenges in the field (Hekkert, 2013).

This integration makes it a logical choice as the foundation of this research, ensuring that the research aligns with proven theoretical and practical frameworks. Furthermore, selecting this process as the primary methodology allows for an adaptable approach to problem-solving, reflecting the iterative and reflective nature of design. Beyond serving as a guiding framework, it also connects the research conducted in this study and the historical evolution of design processes discussed earlier. This ensures that the research is not only grounded in well-established principles but also contributes to the ongoing dialogue of how design methodologies evolve and adapt over time (Hekkert, 2013).

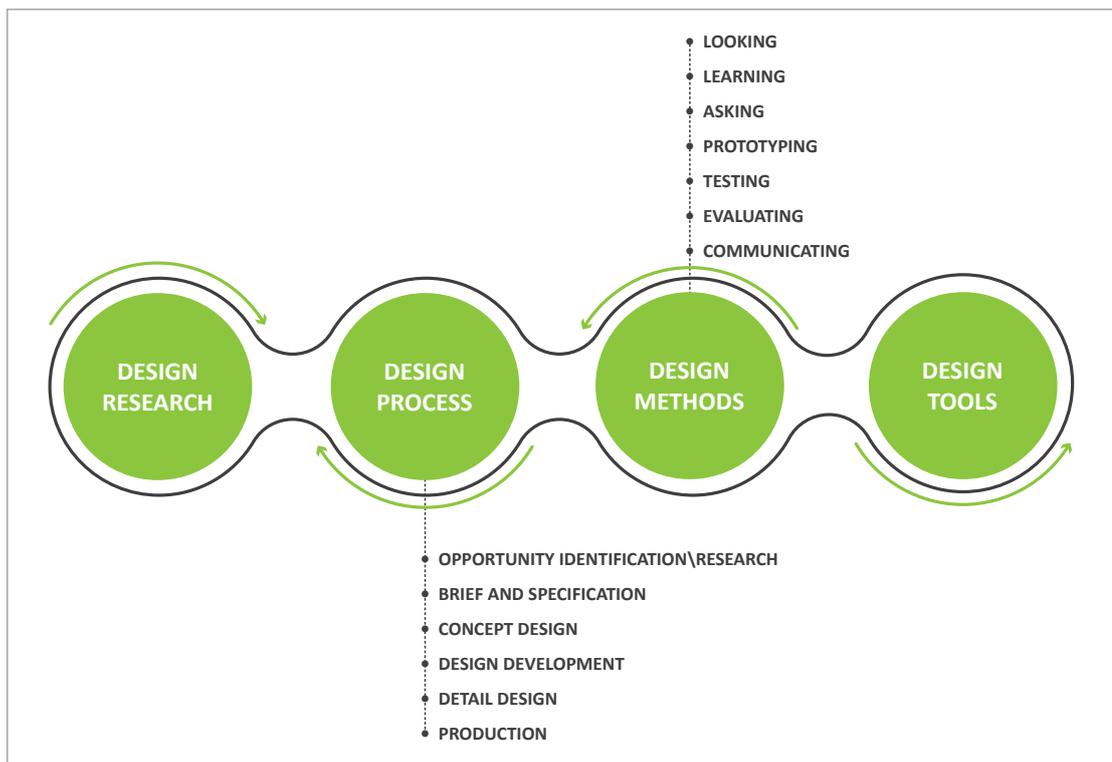


Figure 2-16. Design Research Related Terms after Milton and Rodgers (2013).

Consisting of six stages (Figure 2-17):

- Research (Opportunity Identification).
- Design Brief and Specification.
- Concept Design.
- Design Development.
- Detail Design.
- Production.

This framework allows iteration at each stage, and the detailed stages encounter clarity for deeper exploration during each stage. In addition to the six stages, this process incorporates seven research methods of looking, learning, asking, prototyping, testing, evaluating, and communicating, which are employed during the design process.

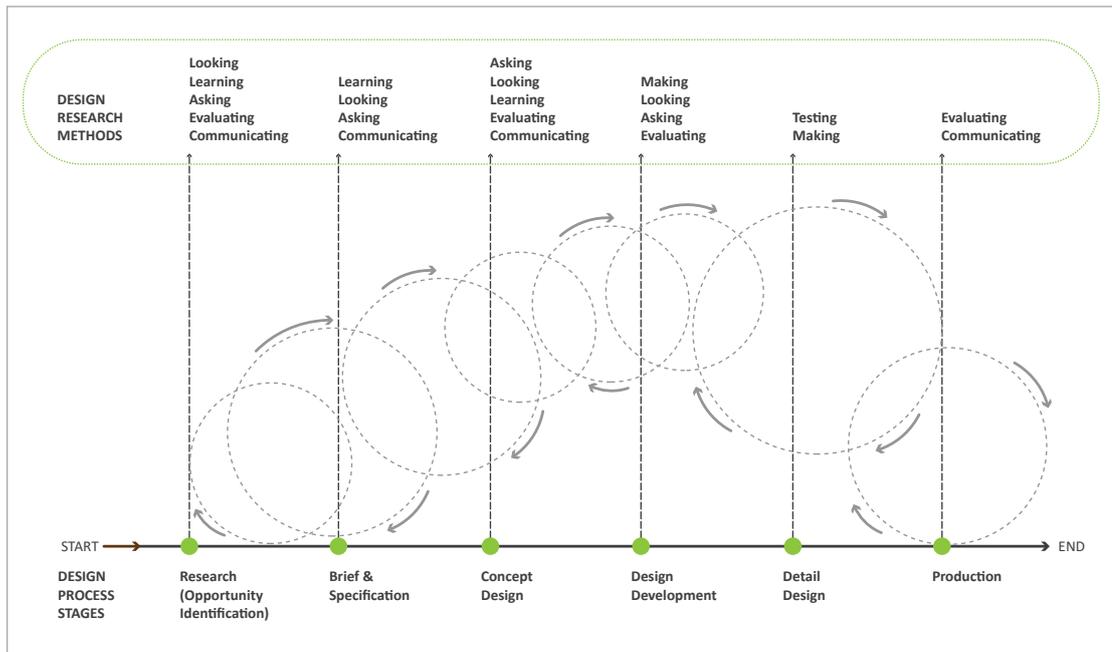


Figure 2-17. Design Process Representation after Milton and Rodgers (2013).

Each one of these methods is supported by a range of research tools and techniques, which serve to uncover deeper insights throughout the design process (Figure 2-18). These tools are important in guiding decision-making and problem-solving, ensuring that the design approach is well-informed and strategically directed. By leveraging appropriate research techniques, designers can analyse complex challenges, gather meaningful data, and refine their solutions, ultimately enhancing the effectiveness of the design process.

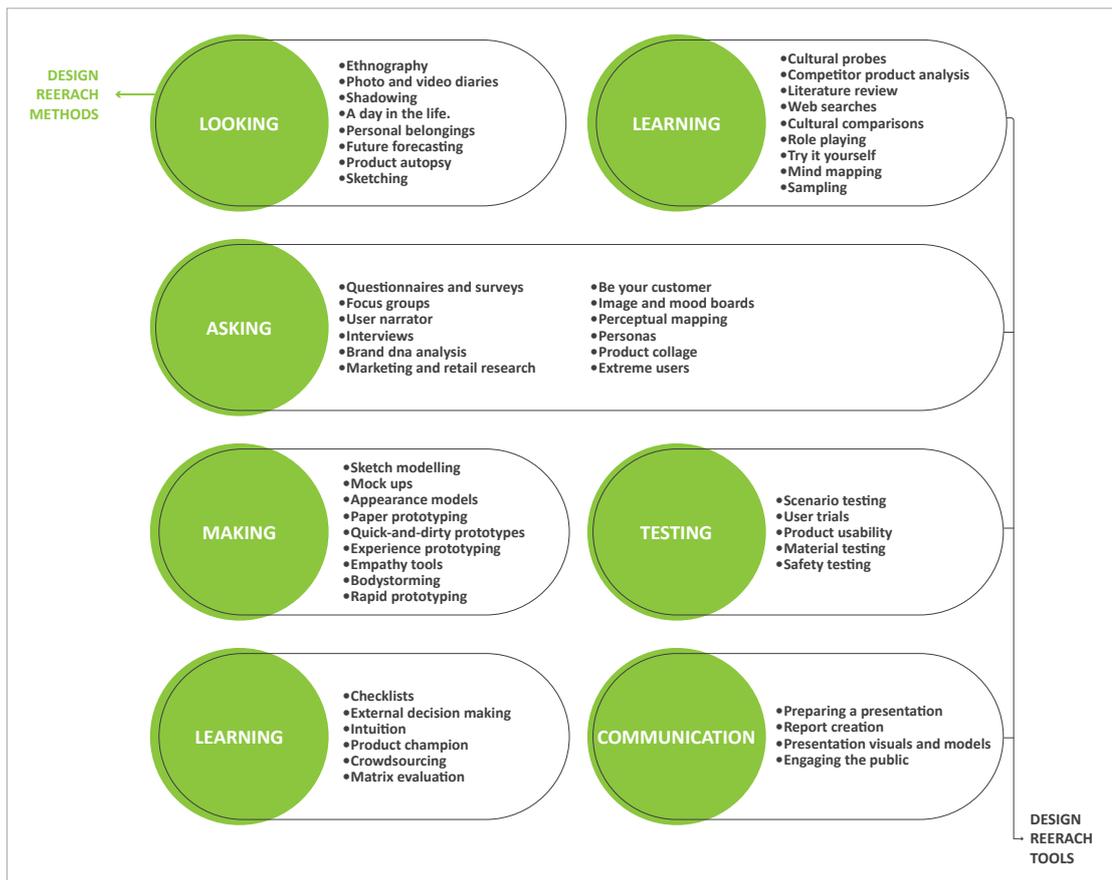


Figure 2-18. Design Research Methods & Tools Representation after Milton and Rodgers (2013).

The first stage of the design process begins with defining the problem opportunity, which involves identifying the needs and desires that the intended solution should address. This is achieved through various research methods. First, looking methods explore the problem by using tools such as ethnography, photo and video diaries, and shadowing to gain immersive insights. Second, they deepen their understanding through cultural probes, literature reviews, and sampling to further contextualise the issue. Third, curiosity drives the inquiry phase, where questionnaires, focus groups, and interviews help gather direct feedback from users. Fourth, designers analyse and evaluate the collected data using tools like intuition and crowdsourcing to extract meaningful insights. Finally, the findings are communicated through presentations or reports, ensuring that insights are effectively shared.

Throughout the brief stage, the learning phase is emphasised, followed by looking, asking, and communicating insights. Moving into concept generation, asking methods become the most important, followed by looking, learning, evaluating, and communicating to refine ideas. During design development, the making process takes centre stage, as it bridges the transition from sketching and conceptualisation to tangible representations of the design. This phase is further supported by looking, asking, and evaluating methods to refine solutions.

The detailed design stage highlights the importance of testing and iterative refinement to create more polished, detail-oriented designs. Various tools such as scenario testing, user trials, quick-and-dirty prototypes, experience prototyping, and rapid prototyping contribute to refining the design. Finally, in the production stage, the design undergoes final evaluation using checklists, external decision-making processes, and intuition to ensure its effectiveness. Meanwhile, the communication aspect is reinforced through visual presentations, models, and public engagement, ensuring that the final design is well-received and understood. The design tools are applied at different stages of the design process, highlighting their appropriate usage and integration within the workflow to support decision-making and problem-solving effectively. Hence, in actuality, the design process rarely follows a linear path. It is common to uncover novel information at every stage, which encourages revisiting previous stages (Milton & Rodgers, 2013).

### 2.2.7 Design Process as Problem Solving

Problem-solving is a fundamental human activity in a professional context and as a life-learning outcome, and design is inherently a form of the problem-solving process (Jonassen, 2000; Silber, 2007). A clear distinction is needed between well-structured and ill-structured problems, as this depends on the nature of the problem (Zannier et al., 2007). Well-structured problems have clearly defined elements, including the problem itself, goals, constraints, solution processes, and expected outcomes. In contrast, ill-structured problems involve uncertainty or ambiguity in one or more of these aspects, such as unclear goals, unknown constraints, or undefined solutions (Figure 2.19). This distinction is influenced by factors such as the problem domain, type, solving process, and nature of the solution (Jonassen, 1997).

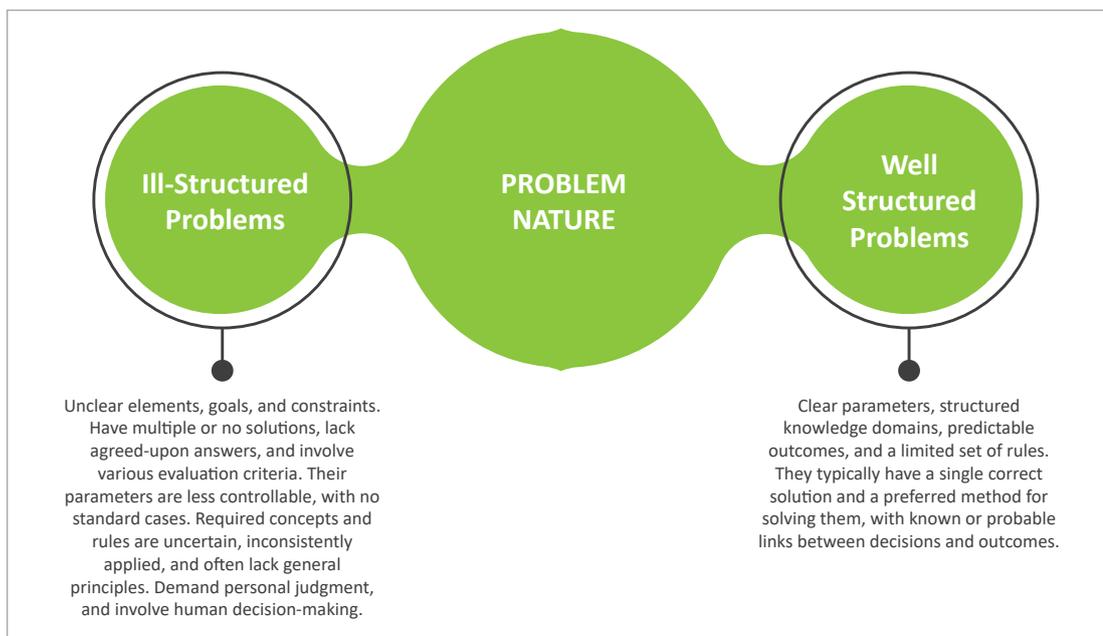


Figure 2-19. Problem Nature.

However, what makes design unique is the dynamic relationship between the design problem and its solutions, where solutions are not merely predefined but evolve through iteration and contextual understanding (Lawson, 2004b). Although design is recognised by the solution created rather than the problem it tackles, understanding the problem type, state, and goal by the designers as problem solvers aids them in identifying the problem space, which is the most important aspect of human goal-oriented activity (Jonassen, 1997; Newell, 1979). Given that the design process deals with ill-defined problems (Buchanan, 1992; Cross, 1982), these problems lack a clear endpoint and are often not immediately apparent and must be discovered through effort, demanding the designer to expand the problem scope (Lawson, 2005). Regardless of that, a full view of the problem is essential in the designers' design process to aid in choosing the proper methods and tools to employ and ensure the solution's effectiveness. Alexander (1966) point out that the complexity of the design problem is beyond the human mind's capacity; therefore, to manage them, designers need to break them down into more minor problems. However, a problem's complexity doesn't relate to the size, showing that even a simple feature can be as complex as a bigger design feature. Yet, Lawson (2004b) argues that the structured problem-solving approach doesn't exist. Since the design process is, the way to find solutions to problems that are ill-defined, ill-structured, and wicked (Buchanan, 1992; Cross, 1982), this dynamic nature of problem definition means that design problems are often solved without ever being comprehensively stated, with the problem and solution co-evolving throughout the process (Newell, 1979). Design problem-solving can be defined as the process of specifying a set of primitive components and their relationships to create an artefact that satisfies a set of constraints, which may include functional goals, parameters, design process limitations, or manufacturing requirements (Brown & Chandrasekaran, 2014).

Yet, an understanding of the problem includes the knowledge underlying the design problem's nature and structure. Dorst (2006) addresses key design problem nature:

- The design problem cannot be fully known at any specific point, as it is embedded in the evolving design situation and must be inferred from designers' actions and words;
- The problem evolves during the design process, with paradoxes (points of discourse clash) shifting over time, even if the underlying discourses remain relatively stable;
- The meaning of concepts used to describe the problem shift as part of the design effort, requiring an understanding of the original discourses to anchor and interpret these changes.

While Brown and Chandrasekaran (2014) suggested three kinds of design problems as follows:

- Class 1 design problem is to consider the extremely innovative behaviour leading to a new and unique invention. The design problems are characterised by their open end in which goals are not specified and design plans are constructed, nor the sequence of action is proposed to create the solution.

- Class 2 design problems, which involve strong problem decompositions but require significant modification or creation of design plans for components, often due to technological changes or complex failure analysis. These problems go beyond routine design when component plans need substantial updates or synthesis becomes highly complex.
- Class 3 design problem involves routine tasks with known decompositions, plans, and failure handling, requiring minimal complex problem-solving. Despite being routine, this kind involves plan selection and backtracking, relying on knowledge-based systems rather than simple algorithms. This class assumes compiled information for backup processes like design criticism and verification (Jonassen, 2008). Moreover, the nature of design problems can be described as determined, underdetermined, and undetermined (Dorst, 2004).

While introducing a model of design where a design problem is conceptualised as a paradox arising from the clash of conflicting discourses, with creative design involving the forging of connections between these discourses (Dorst, 2006). In contrast Brown and Chandrasekaran (2014) suggested that design problem-solving is not a single method but a combination of distinct subprocesses, with the apparent differences across domains and designers arising from the varying dominance of these subprocesses based on available knowledge. Design problem-solving is inherently complex and domain-independent at an abstract level, encompassing activities like planning, programming, and mechanical design, though the specific knowledge and reasoning mechanisms required vary by domain (Brown & Chandrasekaran, 2014) and emerge from the contributions of multiple stakeholders, clients, users, legislators, and designers, each with partial and evolving perspectives (Lawson, 2004b). The design process as a problem-solution process became influential across different design disciplines (Crilly, 2021), and this distinctive characteristic of design problems underscores the importance of the designer's role in shaping and interpreting the problem space, which involves navigating a vast search space of possible solutions, often with incomplete or implicit information about available components and constraints (Brown & Chandrasekaran, 2014; Lawson, 2004b).

However, the lack of systematic post-project data collection and the emphasis on integrative, prescriptive thinking in design education further complicate the application of shared empirical knowledge, resulting in highly selective and value-laden problem-solving approaches (Lawson, 2004b). As a result challenging the need to employ powerful strategies to reduce the search space, as only a small fraction of possible solutions meet the constraints (Brown & Chandrasekaran, 2014).

### 2.2.8 Design Process as Decision-Making

The design process reveals an understanding of how designers create their work (Lawson, 2005). This process is a process of thoughts that employs different activities to transform initial ideas into meaningful solutions (Miller, 2004). The process is designed to explore solutions that incorporate multiple decision-making criteria (Levin, 1966). Zannier et al. (2007) suggested that designers employ rational and naturalistic decisions during their design process. As a result, designers navigate through consequential choices of options or evaluate a single option. Simon (1969) proposed two types of decision-making during the design process: programmed decisions, which are routine and repetitive, handled through standard procedures based on established management guidelines and non-programmed decisions, that is typically one-shot decisions that are usually less structured than programmed decisions (Asemi et al., 2011). In contrast, Schön (1992b) proposed that decision-making during the design process is a personal, subjective, and non-predictive process of naming, framing, moving and reflecting on solutions. As a result, decision-making within the design process can be described as a problem-solving activity or as a reflective practice (Trimingham, 2008). Yet Zannier et al. (2007) claimed that the designer follows a natural decision-making approach, which supports the iterative nature of the design process, providing more opportunities to understand the information related to the decision through the review of the previous decisions. This opinion challenges the norm that sees decision-making in the design process should be explicit and rational (Cooper, 2023). As a result, decision-making activity is complex and plays an important role in relation to the design process, solution, result, and outcome (Almendra & Christiaans, 2009; Hansen & Andreasen, 2004).

Design decision-making integrates skill, knowledge, and values. Skills encompass investigation, invention, implementation, and evaluation (Trimingham, 2008). Hence, decision-making skills are an important aspect and a milestone that leads to successful design (Lindley et al., 2018). While knowledge draws from expertise gained within the project or from others, values guide how information is applied throughout the process (Almendra & Christiaans, 2009). Other design researchers, such as Archer later adopted such a perspective (Trimingham, 2008). Overall, design decision-making is described through various lenses, focusing on key aspects such as selecting the best design solution from multiple alternatives, validating whether a design is fit for purpose and determining the next step in the design process (Asimow, 1962). Furthermore, decision-making is characterised by three core elements, alternatives, consequences, and goals where the aim is to choose the option that best meets the desired objectives (Roozenburg & Eekels, 1995; Zannier et al., 2007). Alternatively, as proposed by the Issue-Based Information System (IBIS), it can be viewed as an argumentative process involving topics, issues, positions, and arguments (Kunz & Rittel, 1970). These perspectives collectively highlight the complexity and multifaceted nature of decision-making in the design process, creating the need for a deep understanding of both the process and the goals. Despite the different perspectives, design decision-making depends heavily on the different uses and knowledge of the design process (Hansen & Andreasen, 2004). Yet, individuals' decision-making often encounters two layers of the

decision loop: analysis paralysis (Kurien et al., 2014; McSweeney, 2019) and decision avoidance (Anderson, 2003). In the first, individuals remain stuck, endlessly seeking more details and options without making progress. In the second, individuals defer decisions, masking their fear with continuous requests for additional information (Cerejo & Carvalhais, 2020).

Given that, designers are at the core of both the design and decision-making processes, utilising decision support tools while embracing intuition and subjectivity as integral aspects of these processes (Buchanan, 1992; Cooper, 2023; Cross, 1997, 2000). Hence, the designer uses various techniques to illustrate how their decisions best fit within the design process. For example, skilled designers balance the attractiveness of solutions with the tractability of the process, using structured evaluation procedures to select the best concept for further development (Hansen & Andreasen, 2004). This suggests that design decisions are not always clear-cut or easily identifiable in real-time. Instead, they are often understood in hindsight, making the design process appear messy and complex rather than structured and systematic.

### *2.2.9 Design Process as Emotional Experience*

While the design process is often described in terms of stages, tools, and methods, it is also deeply influenced by the designer's internal state. Emotional responses, such as excitement during ideation, frustration in the face of constraints, or satisfaction upon problem resolution, are not peripheral to design but actively shape how designers think, decide, and act. Increasingly, researchers are recognising that understanding the emotional dimensions within design practice is essential for enhancing the process and the journey. Therefore, considering the role of emotion more directly in design process, education, and research is essential.

Design, at its core, is the act of conceiving and realising new possibilities (Cross, 1982), often through a dynamic interplay of planning and making (Archer, 1979). As previously discussed, the design process involves iterative exploration, non-linear development, and the navigation of uncertainty (Glanville, 2009) all of which are deeply human activities. Within this complex journey, a range of internal and external factors influence how designers engage with challenges and make decisions. Among these, emotion has emerged as a particularly potent force. Scholars such as Ho (2010) and Crossley (2003) highlight how designers rely on emotional cues to guide ideation and respond adaptively to failure or ambiguity. Emotions not only shape a designer's orientation toward problems but also fuel creativity, motivation, and reflective thinking (Dybvik, 2022; Ho & Chau, 2016). Research has shown that emotions enhance cognitive flexibility, broaden attention, and support complex decision-making and problem-solving (Fredrickson, 1998; Isen & Baron, 1991; Park, 2004). As such, emotion is not incidental elements in the design process, it is a central shaping force.

Emotions serve multiple functions that involve various purposes, including but not limited to managing processes, directing actions, evaluating objects and events, expressing

behavioural, intentions and reactions, and supervising a designer's inner state (Ho & Siu, 2012). Emotion is an essential component that influences our feelings, behaviours, and cognitive processes, and is crucial for enhancing our intellect (Norman, 2004). Papanek (1971), in his definition of design, introduced the designer's sensing and feeling role while designing, assuring that any change will impact the design process. Emotions influence our thinking and actions and act as a perpetual compass for proper conduct (Norman, 2004). Since 1999, the inaugural Design and Emotion conference, the focus has sharpened on developing emotion-focus design processes, with numerous researchers actively contributing to this evolving area (Desmet & Hekkert, 2009). Emotion is being debated, especially in business, education, and design processes (Crossley, 2003).

Research suggests that emotion can enhance designers' abilities to optimise their decision-making and outcomes during design processes (Ho, 2015; Tang et al., 2021). Nonetheless, there is still a lack of research investigating the influence of emotions on the design process and how designers can understand their emotional impact on their processes (Ho, 2014). Moreover, previous studies have explored the relationships between emotion and design. Crossley (2003) explained that being emotionally attuned during the design process can enhance the empathetic approach and reinforce the design vision. Hence, designers employ emotions to reshape and assess the design process using them as a tool and method (Dybvik, 2022; Ho, 2014). In addition, emotions enhance the design process management by integrating more personal experiences and strong emotions during the process (Van Aken, 2005).

#### *2.2.9.1 Emotion Shaping Novice Students' Design Process Dynamics*

Emotions intrinsically influence novice design students' processes by acting as intrinsic factor criteria that shape their judgments and actions throughout the design cycle (Jeannie Lum, 1997). Emotions function as fundamental, non-rational mechanisms that enhance a designer's capacity to make choices, particularly within the uncertainty that characterises design projects (Ho, 2024). Enhanced emotional or affective mechanisms enable individuals to make prompt decisions between favourable and unfavourable options, reducing cognitive overload. Integrating emotional considerations into the process can therefore augment the designer's overall decision-making capacity (Ho, 2023). Moreover, emotions play an essential role in information processing, in which emotional fluctuations also help designers discriminate between different types of information, facilitating the selection of optimal problem-solving strategies (Damasio, 2006).

The intrinsic emotional state of novice designers directly influences how they manage the controllable internal factors within a project (Van Aken, 2005). Students engage their emotions when making judgments on internal aspects while processing information (Kaufmann, 2003). These emotionally informed decisions shape subsequent activities and directions in the design process. Emotion can also enhance or hinder decision-making (George & Dane, 2016). For instance, students may proactively regulate emotions by listening

to music, for example, to establish a productive mood for focused work (Kaufmann, 2003). Shifts in emotional states can trigger new perspectives, inspiring innovative thinking and improving idea quality. Furthermore, emotions function as an internal assessment tool: when students reflect on their emotional experiences, these reflections inform and refine future decision-making under similar design circumstances (Creusen & Schoormans, 2005) .

The dual nature of emotion means that both positive and negative emotions play critical, yet distinct, roles in design students design process. Positive emotions such as satisfaction, pride, and joy act as strong motivators that support productive outcomes (Scherer & Tran, 2001). They strengthen confidence, encourage perseverance, and broaden students' perspectives when tackling design problems (Norman, 2003; Scherer & Tran, 2001). Conversely, negative emotions can hinder students process and lead to less effective outcomes (Ho, 2023; Isen & Baron, 1991). However, antagonistic emotions such as anger or frustration can also serve as motivational forces that drive students to overcome challenges and explore alternative solutions (Costa et al., 2015). Negative emotions may act as internal warning mechanisms, prompting students to think critically and reconsider risky or impulsive choices, thereby promoting more rational decision-making (Lomas, 2023; Maldonado et al., 2022) .

Despite the central role of emotion in design practice, novice students often struggle to employ its influence effectively due to limited experience and insufficient training (Ho, 2023). Many find it difficult to make successive decisions based on emotional cues, failing to connect their affective experiences to subsequent judgments. Although students often acknowledge that emotions influence their everyday decisions, they rarely recognise that the same principle applies within the design process (Tang et al., 2021). This lack of awareness stems from an incomplete understanding of emotion itself and its significance in shaping creative judgment. While some novices attempt to moderate their emotions to improve design outcomes, they frequently fall short because they do not understand why or how these emotional mechanisms affect their performance (Ahmed et al., 2010).

In essence, emotions act as an intrinsic foundation of the decision-making framework for novice design students, dictating efficiency, guiding perception, and motivating creative direction. Yet, due to inexperience and a lack of emotional awareness, this powerful intrinsic influence is often mismanaged, underutilised, or entirely unrecognised within early design education.

As a result, design as a discipline has developed tools and methods specifically aimed at understanding these emotional and subjective experiences. Approaches such as cultural probes and other design-led research techniques provide ways to access, surface, and interpret emotional dynamics in context, enabling designers to engage more sensitively and critically with the affective dimensions of practice.

## 2.2.10 Design Probe as Emotional Exploration Tool

This section explores the use of design probes as a methodological tool to understand subjective experiences during the design process. Given that this research focuses on the emotional experiences of design students, it is crucial to employ a tool that captures personal reflections, emotions, and non-tangible experiences that may not be easily accessible through conventional research methods. Design cultural probes offer a means to navigate and document students' design journey, providing insights into how emotions shape decision-making and engagement with their projects.

### 2.2.10.1 What is a Design Probe?

The design probe emerges from the continuous evolution of the design field, incorporating evolving methods and accompanying tools. This establishes a strong need for tools that emphasise experimentation and interaction to aid the design process. Design probes are defined as tools for understanding human experiences, emphasising active reporting, recording, and self-documentation (Mattelmäki, 2006). Since then, design probes have incorporated various design process values and purposes with lessons to learn from (Graham et al., 2005). Design probes originated as part of culture probes, which were pioneered by Bill Gaver and others, in addition to the use of ethnography in design (Hemmings et al., 2002). Gaver (2001) stated that probes don't include the researcher's point of view but are considered tools that elicit inspirational insight and data from others. So, probes are distinguished by three key qualities:

- They are design-oriented and exploratory, aiming to uncover new opportunities rather than solve known problems;
- They focus on users' subjective experiences, encouraging interpretations and explanations; and
- They rely on self-documentation, where users actively record their experiences and ideas (Mattelmäki, 2005). As a self-documentation tool, probes help bridge the gap between designers, researchers, and users (Gaver et al., 1999).

Accordingly, probes can be owned by researchers or shared with participants, and they often generate evocative narratives or scenarios that inform or inspire design (Graham et al., 2005). Therefore, designers use probes as a creative method to gather data with minimal intrusion (Milton & Rodgers, 2013) while uncovering new opportunities (Mattelmäki, 2006). This method is considered valuable for self-documentation, as it enables data collection from real-life scenarios, enhancing both credibility and reliability (DeLongis et al., 1992). Furthermore, it reduces researcher bias and allows users to provide more detailed and insightful responses (Carter & Mankoff, 2005). By capturing context-related experiences in real-time, probes promote transparency and ensure the integrity of the collected data (Brown et al., 2000; DeLongis et al., 1992).

A probe is typically introduced as a designed kit containing various tools, instruments, or objects tailored to fulfil specific research tasks, assignments, or activities (Mattelmäki, 2006). By gathering clues from users' lives and thoughts, probes generate inspirational responses (Gaver et al., 1999). As a result, they serve as powerful tools for designers, offering valuable user insights and fostering a deeper connection between users and designers (Mattelmäki, 2005). However, probe-based methods also present challenges. The data collected can be overly vague and fragmented, making translating into concrete design decisions difficult (Mattelmäki, 2006). Additionally, researchers have limited control over participant responses, which may lead to incomplete or non-returned probes, making the process costly with uncertain outcomes. The success of this method largely depends on the initial relationship between designers and participants, as designers can only access the information that participants choose to share, with no means of verifying its validity (Townsend & Patsarika, 2022). Furthermore, probes function as a form of inquiry, where participants' individual interpretations shape responses. Designers must then interpret these responses without guidance that considers cultural, contextual, or communicative factors (Townsend & Patsarika, 2022).

#### *2.2.10.2 Probe Types and Applications*

Probes are described as tools that can make the invisible visible, capture fragmentary data, and elicit inspirational responses from participants (Graham et al., 2005). However, several design probe tools have been developed during the last decades to capture the value, needs, and emotional engagement from various real-life scenarios, creating credibility and reliability to the information gathered (DeLongis et al., 1992; Desmet et al., 2021; Mattelmäki, 2008). These probe tools can be classified into four main categories:

- Cultural Probes, the artistic approach where data is collected by a kit designed for the study aiming at creating a space for new possibilities and being away from any information that can be understood through the needs and desires (Gaver et al., 1999).
- Informational Probes are based on needs, and they gather sensitive information instead of using inspirational probes (Crabtree et al., 2003; Hemmings et al., 2002).
- Technological Probes in which the information is gathered with the aid of technology applications, aiming to collect data on the user and the use of technology by reflecting on their real-life at a current moment (Hutchinson et al., 2003).
- Emphatical Probes, in which a narrative is created to mimic and interpret the user experience to ensure meaningful engagement within the design processes (Mattelmäki, 2006).

Among these four categories, the cultural probe has been widely applied in design research due to its exploratory nature and ability to capture subjective experiences through self-documentation. Hence, several instruments on self-documentation to capture emotional experiences during designing have been developed due to the growing interest in the

connection between emotion and design (Desmet, 2018). However, measuring emotion tools goes under the Implicit Methods, which don't count on self-reporting or under the Explicit Methods, which depend on self-reporting for evaluation purposes (Mojet et al., 2015; Schouteten et al., 2021).

Further, probes encompass a range of applications, from unsystematic cultural exploration to more structured, scientific data collection, and can be used in various contexts (Graham et al., 2005), as well as they are applied in user-centred design for four main reasons: inspiration, information, participation, and dialogue (Mattelmäki, 2005). The application can vary between inspirational, informative, participatory, and dialogue. Inspiration probes aim to spark creative thinking by providing open-ended, aesthetic tasks that encourage interpretation and generate new insights for designers (Gaver, 2001). The results are often shared as raw data or stories, focusing on patterns and appealing ideas rather than strict objectivity (Gaver et al., 1999). Information probes seek to gather subjective data about users' experiences and needs, often in the early design phases. These probes are more descriptive and less interpretive, transforming users into active participants in documenting their lives (Crabtree et al., 2003; Hemmings et al., 2002). Participation probes involve users directly in the design process, empowering them to experiment, observe, and record their experiences (Paulos & Jenkins, 2005) using creative tools. This approach encourages user imagination and interaction with technology or prototypes (Hutchinson et al., 2003). Dialogue probes aim to build a collaborative relationship between users and designers, fostering continuous conversations and mutual understanding (Crabtree et al., 2003). Overall, probes serve as versatile tools to enhance creativity, gather insights, engage users, and facilitate communication in the design process.

To deepen the understanding of design students' experiences and build a solid foundation for this research, it is now essential to understand the role of emotion. Emotions play important part in shaping engagement with the design process, influencing motivation, decision-making, and overall learning experience. The following section explores key emotional theories and frameworks relevant, providing the necessary background to support the study's investigation into emotional experiences.

## 2.3 Emotion

### 2.3.1 What is Emotion?

What is emotion? This question remains unanswered, yet everyone has their own thoughts on it the moment it is mentioned. Aristotle explains that emotions transform an individual's state, influencing their judgment by involving experiences of pleasure and pain (Fortenbaugh, 1975; Solomon, 2008). At first glance, it seems easy to understand, but a significant debate exists among researchers striving to define emotions, specifically among psychologists. Different uses of emotions reflect different definitions and functions; therefore, no common agreement exists on one definition of emotion (Izard, 2010). This highlights the multifaceted nature of emotions, revealing their depth and the challenges in defining them. Emotions are not singular or easily categorised; they encompass various influences by different factors, including cultural, psychological, and physiological (Frijda, 1986). Their complexity lies in their fluidity, instability, subjectivity, and the way they appear depending on what appraisal, motivation, and arousal impact them (Scherer, 2005). Fantino (1973) stated, *"One reason for this dearth of knowledge and agreement about emotion is the problem of defining what emotion is"* (Fantino, 1973, p. 282). The emotional processes, mechanisms, states and experiences are complex, making it harder once a satisfactory definition appears, a new theory emerges unexpectedly (Solomon, 2008). However, the consistent research efforts on emotion to find this missing definition led to the investigation of the different emotional features, including but not limited to components, patterns, states, and experiences, in the hope of helping guide the challenge of the definition (Lewis et al., 2010).

Emotion, among other phenomena, represents one type of effective process, yet emotion is used to label a wide phenomenon spectrum, including feelings, moods, traits, motivations, responses, states, and experiences (Kleinginna Jr & Kleinginna, 1981) that create a noticeable conflict in distinguish emotion and other phenomena. Young (1961) explained that emotions are not the only way we experience affect processes; however, emotions stand out as time-limited, sharp, powerful, and disruptive, among other processes. Accordingly, 'affect' or 'effective process' is used to distinguish the various phenomena by their characteristics (acute, intensity, duration) or the source of stimulation and origins (Frijda, 1994). Emotions are defined by the connection between an individual and a particular object, a bond that may last only seconds or minutes. This process arises when a stimulus is instantly or reflectively interpreted, triggering emotional reactions and prompting attempts to regulate emotional behaviour (Ekman, 1977). However, Izard (2010) highlights a significant shift in emotion research compared to a previous extensive study by Kleinginna Jr and Kleinginna (1981). The key findings from the study conclude that there is a greater emphasis on the multifaceted nature of emotions nowadays, the acknowledgement of their complexity, and the tendency to move away from the single-aspect definitions. In contrast, Walle and Dahl (2020) emphasise the importance of clear definitions of emotion for advancing research in emotional development, and suggest that an understanding can be achieved by contrasting two primary approaches to defining emotions: the structuralist and functionalist

perspectives. Structuralist approaches view emotions as fixed combinations of internal feelings, physiological responses, and facial expressions, assuming a direct link between a stimulus and a specific emotion (Feldman Barrett & Russell, 1998). Controversially, the functionalist approach defines emotions as responses to situations appraised as personally significant, involving appraisal (evaluating the situation) and action tendencies (how one responds) by emphasising that emotions arise from the relation between the individual and the environment, not just the stimulus itself, allowing for variability in emotional responses (Frijda, 1986; Lazarus, 1991). Thus, the functionalist approach is considered to be more helpful in studying emotion due to focusing on the relational and adaptive nature of emotions by providing a more comprehensive understanding of emotional development compared to the rigid, stimulus-response models of structuralist approaches (Walle & Dahl, 2020).

This research primarily focuses on emotions and their related concepts; understanding other terms is essential for developing a more comprehensive perspective. Three closely intertwined terms often appear interchangeably in emotion research: affect, emotion, and feeling (Figure 2-20). Affect is the broader abstract term that refers to the experience of feeling or emotion. It is often described as the outward expression of emotion (Barrett, 2006; Barrett & Russell, 1999) and can be observed through facial expressions, tone of voice, or body language. Affect can be positive, negative, or neutral and is often described as valence (positive/negative) and arousal (intensity, activation/deactivation) (Russell, 2003). Emotions are complex and include multi-component responses to internal or external stimuli (Damasio, 1999). They involve physiological arousal, expressive behaviours (e.g., facial expressions), and subjective experiences (Ekman, 1992b; Scherer, 1982b, 2005). Emotions are often short-lived and have an evolutionary basis, serving adaptive and survival functions (Ekman, 1992b). Feelings are the subjective, conscious experience of emotions (Barrett, 2006; Damasio, 1999) which have a distinctive structure evoked by sensations or images and emerge in thoughts (Solomon, 2008). They are the mental representations of physiological changes occurring during an emotional response (Scherer, 1984). Feelings are personal and internal and depend on previous experiences (Shouse, 2005), making them harder to measure objectively than emotions or affect.

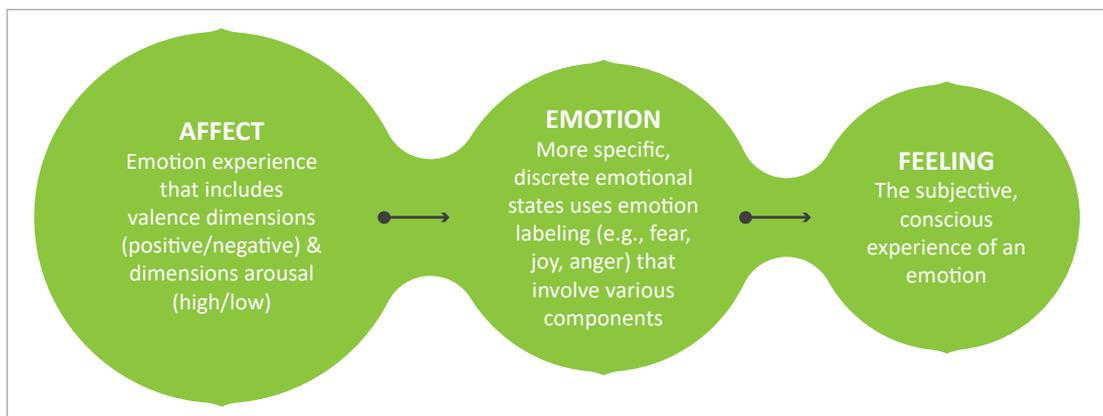


Figure 2-20. Emotion Interchangeable Terms.

Despite the agreement that emotions influence thinking, decision-making, actions, and well-being, as well as the general acceptance on their activation, functions, and regulation, no singular definition of emotion has been universally accepted (Izard, 2010). As a result, emotions remain a complex psychological process composed of multiple components, including cognitive, physiological, and subjective elements (Berkowitz & Harmon-Jones, 2004). The interaction between these components shapes the emotional experiences (James, 1884; Scherer, 2005) which can vary based on stimulus events, appraisals, responses, and reactions (Ekman, 1992a). This means the term emotion should be accompanied by clarification based on the context within which it is used, as it cannot be defined under a single, universally accepted meaning.

### *2.3.1.1 Emotion Components*

Emotions make us unique individuals with unique emotional fingerprints; the differentiation comes from the variation of how we express, experience, and elicit emotions. Hence, emotions are multi-component ( Figure 2-21) and dynamic phenomena (Scherer, 2009). This approach to emotion suggests that emotions don't follow a fixed pattern and they evolve dynamically over time (Kuppens et al., 2009). Therefore, individual emotional experiences are shaped by the individual appraisal. Appraisal refers to the subjective meaning and how each individual copes and evaluates certain events, which rely greatly on the person's accumulated experiences (Frijda, 1986; Scherer, 2001). The components of emotion are diverse and encompass various elements, including core affect, cognitive appraisals, action tendencies, and physiological responses (Ekman, 1977; Scherer, 2005). Although these components can function independently, their flexibility allows them to interact, influencing one another and contributing to the process of assigning an emotional label to specific experiences and responses (Barrett & Russell, 1999; Frijda, 2008; Scherer, 2009). Accordingly, emotional components change over time and vary across individuals in duration and intensity depending on personal traits and states (Lewis et al., 2010). The multiple emotional components, including subjective feelings, physiological arousal (e.g., heart rate, muscle tension, body temperature), and behavioural tendencies (e.g., responses, body language, actions, and expressions) (Sacchi & Dan-Glauser, 2024). Hence, these components are driven by a situation that is then appraised (cognitive appraisals, what is happening, expectations, thoughts), helping to establish the emotional experience (Scherer & Moors, 2019). As a result, emotions are involuntary, and an individual is unable to control them, which explains the use of some expression to describe them, such as someone falling in love or being overwhelmed by excitement, etc. (Scherer, 2009).

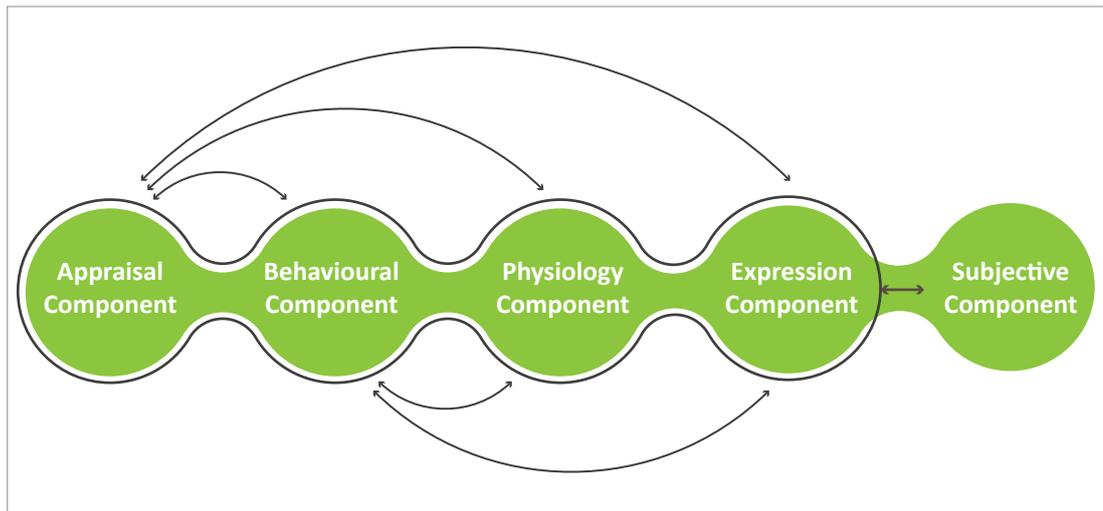


Figure 2-21. Emotion Component Representation after Scherer (2009).

### 2.3.1.2 Emotion Experience

As Frijda and Mesquita (1994) noted, emotion unfolds as a process and a sequence of steps that begins with an event evaluated by the individual. However, this process does not initiate until the event is appraised as personally relevant to one or more concerns, forming the emotional responses called emotion's significance or emotion felt/feelings. Emotional significance includes the individual interpretation of the meaning related to the root of one's previous experiences and situations (Frijda & Mesquita, 1994). Moreover, emotional phenomena can be in the form of a state or a trait, and the differentiation between them can happen based on their time and duration (Izard, 1977). Thus, an emotional state is characterised by its higher intensity, temporary, short duration, and situation-dependent, whereas an emotional trait is known by its frequent occurrence, longer-lasting nature and persistence over time (Desmet, 2002; Izard, 1971). To be in an emotional state is to personally experience that emotion in a way that is unique and deeply felt. It represents more than a reaction; it is a distinct perspective that shapes how we perceive and engage with the world (Lambie & Marcel, 2002). Therefore, emotion labelling is considered an important part of the emotion process. Giving a specific term/word that is attached to different parts of the emotion process and is applied by individuals flexibly based on the most noticeable emotional component at the moment (Frijda & Mesquita, 1994).

As a result, emotional experience refers to the subjective feeling state that arises in response to the emotional significance of an event or stimuli. Emotion experience is central to how individuals interpret and interact with their environment and preserve the meaning of the world infused with action (Frijda, 1986, 2005). When we experience emotions, we are consciously aware of them, but this experience is built upon deeper nonconscious processes that shape how we feel and react. Therefore, the structure of emotional experience consists of both conscious correspondence and nonconscious components (Frijda, 2005; Lambie & Marcel, 2002). Lambie and Marcel (2002) defined the conscious correspondence build upon

attention aspect of emotional object awareness experience including attention direction (external world or internal oneself), attention focus (emotional object's evaluation or one's action readiness), and attention modes (analytic or synthetic, detached or immersed). While, Frijda (2005) in connection to the conscious reflections defined the four automatic nonconscious components of emotion including affect, appraisal, action and arousal (Figure 2-22). He also added that the emotion experience take different forms: as feelings, bodily states, perceptions, or awareness of meaning. They vary across languages, are intentional, involve action readiness, challenge neuroscience, and integrate multiple mental processes (Frijda, 2009).

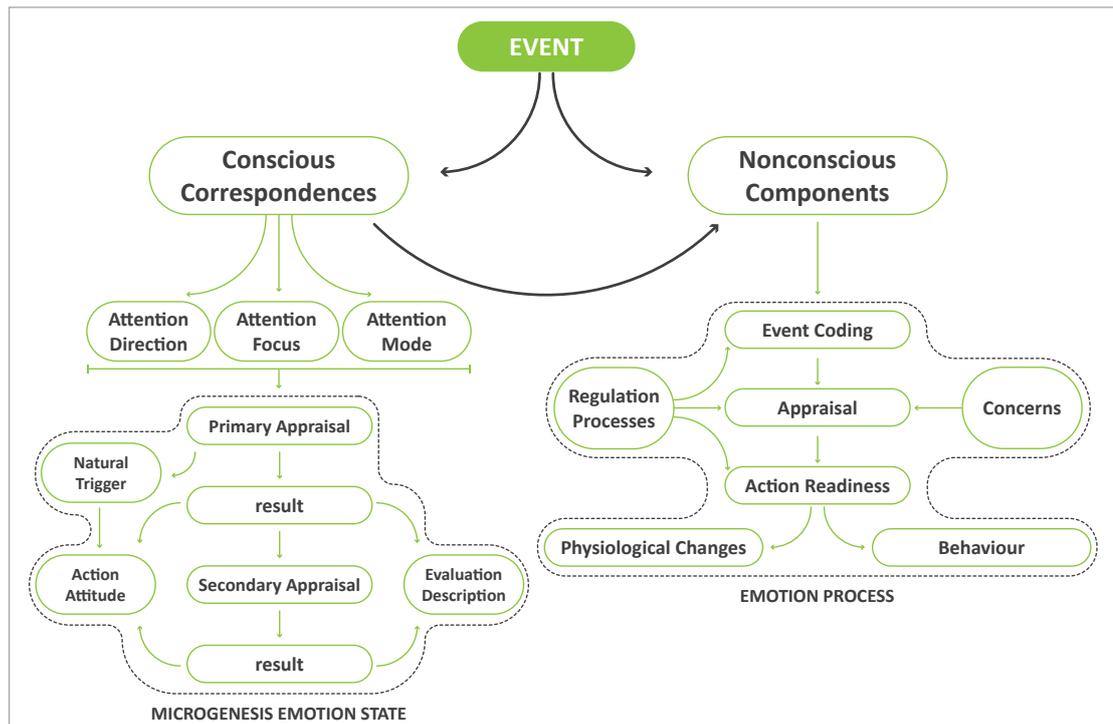


Figure 2-22. The Emotion Experience Representation after Frijda and Mesquita (1994), Izard (2010), and Lambie and Marcel (2002).

### 2.3.2 Theory of Emotions

The roots of emotion can be traced in ancient philosophy from the time of Socrates, and his students Plato and Aristotle. Socrates considered emotions dangerous and needed to be controlled by reason. Plato, on the other hand, did not see emotions as separate things on their own. Instead, he believed emotions were spread across three parts of the soul: reason, spirit, and appetite. Importantly, Aristotle was one of the first to develop a structured theory of emotion that defines emotions as a state which influences judgment and is accompanied by feelings of pleasure or pain (Fortenbaugh, 1975; Solomon, 2008).

During the time of Socrates and his followers, reason was considered more important than emotion and held a dominant role in philosophical thought. However, several philosophers later challenged this view and advocated for the significance of emotion. For example, in the 18th century, a declaration by the Scottish philosopher David Hume saying "Reason is, and

*ought to be the slave of passion*" (Davidson, 1976, p. 752) challenges the reason's dominance, arguing that emotions (or passions) guide human action and morality and highlighting that emotion is no less critical than reason (Hume, 1888). Furthermore, Nietzsche critiqued rationalism, arguing that emotions, especially strong passions, shape moral and social life (Nietzsche, 1967). Such perspectives highlight the celebration of passion and instinct over reason, which anticipated existential and psychoanalytic theories. Given that, the philosophical perspective on emotion has always been present within psychology. However, it was in the 19th century that psychologists began to show a deeper interest in studying emotions, leading to the development of many foundational theories that continue to shape today's discussions.

Emotion theory changed significantly over time, as summarised in Figure 2-23. However, this section primarily explores contemporary emotion theories around the 19th century, as they are more relevant to the research's aims and contributions. These emotion theories can be divided into the following traditions: the evolutionary theory of emotion, the bodily feeling theory, the mental emotion theory, the psychoanalytic theory, and the cognitive theory (Reisenzein, 2000).

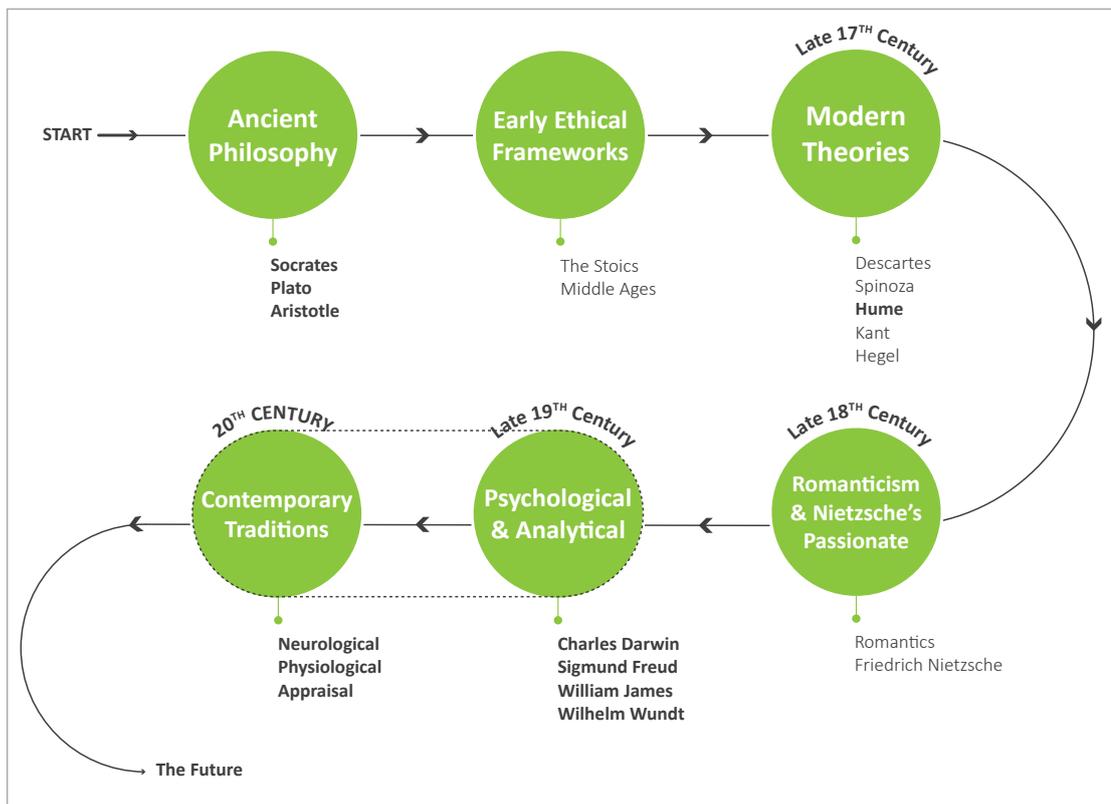


Figure 2-23. Emotion Theory Timeline.

### 2.3.2.1 Evolutionary Emotion Theory

Evolutionary Emotion Theory focuses on emotion function and understanding emotional reactions as a class of mental states caused by an appraisal of an event (Sreeja & Mahalakshmi, 2017). This perspective is highlighted and rooted in Charles Darwin's book 'The Expression of Emotions in Man and Animals', which explains emotions as inherited expressions, not learned experiences; they are expressive and recognised by facial expressions, body language and vocal changes (Reisenzein, 2024). These expressions are shared across species, assuring their biological function for communication and survival (Darwin, 1872). In addition, emotions are adaptive and evolved expressions that rule the behavioural action of individuals (Desmet, 2002; Hess & Thibault, 2009). This theory was again revived by focusing on the facial expression feedback led by Tomkins (1963), Izard (1994) and Ekman (Ekman et al., 1972). Emotion is based on 'affect' and involves changes in muscles, vascular, and hormonal reactions, which are mainly visible in facial expressions as well as the whole body. These effects play as motivators driving individual behaviour and action (Frank & Wilson, 2020; Tomkins, 1963). Moreover, the 'basic emotions' theory explains that emotions are inborn and consist of discrete modules of basic biological emotions, which can be noticed by observing the facial expression (Ekman, 1992a). These emotions differ based on the stimulation events, appraisals and behavioural responses (Ekman, 1977). Emotions are temporary and subjective, highlighting the personal and introspective nature of their experiences. However, emotions are also complex, necessitating a deeper understanding of their experiences, the underlying processes occurring in the brain, and the observable patterns reflected in facial feedback (Izard, 1971, 1977, 1991). Further, Plutchik (1980) proposed that emotions are responses triggered by external stimuli and directed toward the source that provoked them. Rather than being solely driven by physiological states, emotions arise from an individual's evaluation of an object or event to serve a basic need (Desmet, 2002). Plutchik suggested that emotions are not instinctively tied to specific environmental elements, such as food or water, but instead emerge as a result of perception and interpretation. These emotional responses serve an adaptive function, shaping behaviours and interactions with the surroundings (Plutchik, 1965, 1980, 1991).

### 2.3.2.2 The Bodily Feedback Theory

The Bodily Feedback Theory approach focuses more on the nature of the emotional experiences concerning the physiological bodily change, which is essential and the heart of emotion. William James is the father of this theory. From his perspective, emotions appear as a result of a change in our body first due to a perception of a stimulus, which means that the body reacts automatically before feeling the emotions (James, 1894). The change includes obvious physical changes such as an increase in heart rate, sweating, shaking, etc. This perspective is clearly presented in James-Lange's Theory of emotions, advocating that bodily responses create emotions (James, 1884; Lange, 1992). As well, this theory is named James-Lange Somatic Theory, in which somatic means body that represents the starting point of emotion creation; we experience emotions internally in response to physiological changes. So your body will react by pumping up heart rates and other physiological changes, and this

gets detected by the brain and creates a subjective emotional experience or feeling of happiness or fear, etc. (James, 1894, 1994; McFarlane, 2024).

In contrast, Cannon (1928) argued James' approach pointing that emotions and physiological (bodily) responses occur at the same time but separately, rather than emotions arising from the bodily reaction. When an emotional stimulus is perceived, the brain processes it along parallel pathways. Two main paths are processed along the thalamus, which is the brain part that processes sensory information and sends it to other parts of the brain. One is the thalamus to the body, which triggers autonomic and physiological changes (e.g., increased heart rate, sweating, muscle tension), and the other one is the thalamus to the cortex, which processes the subjective emotional experience, allowing conscious awareness of emotions (Cannon, 1928; Ningjian, 2024). In contrast, feedback from the body is considered unnecessary and insufficient for emotional experiences (Reisenzein & Stephan, 2014).

### *2.3.2.3 The Mental Emotion Theory*

Whereas the Bodily Feedback Theory focuses on the nature of emotion, the Mental Emotion Theory focuses on the structure of the emotional experiences. This theoretical approach is considered a foundational concept in the history of psychology, and the credit goes to Wilhelm Wundt, the father of modern psychology, with his Tridimensional Theory of Feeling (Wundt, 1898). First, Wundt's theory emphasises that emotions are distinct conscious states generated by the central nervous system and composed of elementary feelings, which can be understood through three primary dimensions: pleasure-displeasure, excitement tranquillisation, and tension-relaxation, forming cohesive system (Reisenzein, 1992). This means every emotional experience could be represented as a point in this three-dimensional affective space. The quality of the feeling is determined by its orientation within the space, and its intensity is represented by the distance from the centre (Wundt, 1898). Second he proposed that emotions influence the thought processes and lead to actions by seamlessly blending into acts of willing, which are the immediate causes of behaviour (Judd, 1897; Reisenzein, 2024).

Wundt's theory laid the groundwork for later dimensional theories of emotion, such as the pleasure-arousal model proposed by Russell (1980). Moreover, constructivist theories of emotion, which suggest that emotions are constructed from core affective states (e.g., pleasure-displeasure and arousal) and cognitive interpretations, also owe a debt to Wundt's ideas.

### *2.3.2.4 The Psychoanalytic Theory*

This theory is based on Sigmund Freud's psychoanalytic theory, which focuses on the structure and dynamics of the mind. Freud's theory of emotions, often referred to as the psychoanalytic theory of affect, emphasises the role of unconscious processes, drives, and the interplay between pleasure and displeasure in shaping emotional experiences (Freud, 2005). Emotions, or 'affects,' are closely tied to the unconscious mind and

the motivational system. A key distinction to this theory approach is that Freud argues that humans are driven by the desire to maximise pleasure and minimise displeasure in which pleasure arises from the satisfaction of drives while displeasure results from their frustration (Reisenzein, 2024).

### *2.3.2.5 The Cognitive Theory*

This theory is currently the most widely recognised and has attracted significant attention. It serves as a common ground where the key aspects of the four previous theories largely align. The emotion cognitive theory posits that emotions are primarily caused by cognitive processes, such as beliefs, judgments, and evaluations (appraisals) of situations or objects. In the cognitive view, emphasis is placed on the role of mental representations and intentionality in shaping emotional experiences (Meinong, 1972). Alexius Meinong and Magda Arnold are regarded as this approach's earliest and most influential pioneers. This theory focuses on cognitive evaluations of situations or objects that elicit emotions (Arnold, 1960). These evaluations involve beliefs, desires, and judgments about the significance of events (Meinong, 1972). At the core of the cognitive theory is the concept of intentionality, which refers to the object-directed nature of emotions. This means that emotions are not solely reactions to events but are shaped by what those events mean to the individual (Reisenzein, 2024; Reisenzein & Döring, 2009). Meinong (1972) argued that the primary function of emotions are informational that provide insight into the value (goodness or badness) of objects or states of affairs. While Arnold (1960) emphasised that appraisal is the essence of emotion, without an appraisal there is no emotion and maintaining that emotions always involve assessing how an object or event benefits or harms the individual (Desmet, 2002).

This theoretical approach opens the way for other researchers to adopt and refine it with their unique perspectives. Drawing on both the James-Lange Theory and the Cannon-Bard Theory, the Schachter-Singer Theory, also known as the Two-Factor Theory of emotion, is a cognitive theory of emotion that emphasises the role of physiological arousal and cognitive interpretation in the experience of emotions (Schachter & Singer, 1962). According to this theory, emotions result from a two-step process; first, physiological arousal occurs in response to a stimulus, and second, the individual cognitively interprets the cause of this arousal to label the emotion (Dror, 2017). In contrast, according to Lazarus (1991) the founder of the Cognitive Appraisal Theory, thinking happens first and before the emotional experience. This means emotions are not automatic responses to stimuli but are instead determined by how individuals interpret and evaluate the significance of those stimuli. This means that the way a person interprets a situation's relevance and coping determines the emotion they experience. For example, if you encounter a bear in the woods, your brain might appraise the situation as dangerous (primary appraisal) and evaluate your ability to escape as low (secondary appraisal). This leads to the emotional experience of fear and the physiological response of the fight-or-flight reaction (Lazarus, 1982, 1984, 1991).

The theories of emotion discussed (Figure 2-24) each offer unique perspectives on how emotions arise and function. The Evolutionary Theory suggests that emotions evolved to aid survival. The James-Lange Theory proposes that emotions result from translating physical reactions (James, 1885), while the Cannon-Bard Theory argues that emotions and physical reactions happen at the same time (Cannon, 1928). The Schachter-Singer Theory emphasises that emotions source from cognitive evaluations of physical responses (Schachter & Singer, 1962). Similarly, the Cognitive Appraisal Theory states that emotions arise from our interpretations of events (Lazarus, 1991). Lastly, the Facial Feedback Theory suggests that facial expressions can influence emotional experiences (Ekman et al., 1972; Izard, 1977; Plutchik, 1982). Together, these theories provide a rich foundation for understanding the complexity of emotions, opening the door to developing dimensional and categorical models of emotion. These models, which will be explored in the next section, build on the insights of these theories to categorise and measure emotions in ways that reflect their multifaceted nature, whether through continuous dimensions (e.g., valence and arousal) or discrete categories (e.g., joy, fear, anger).

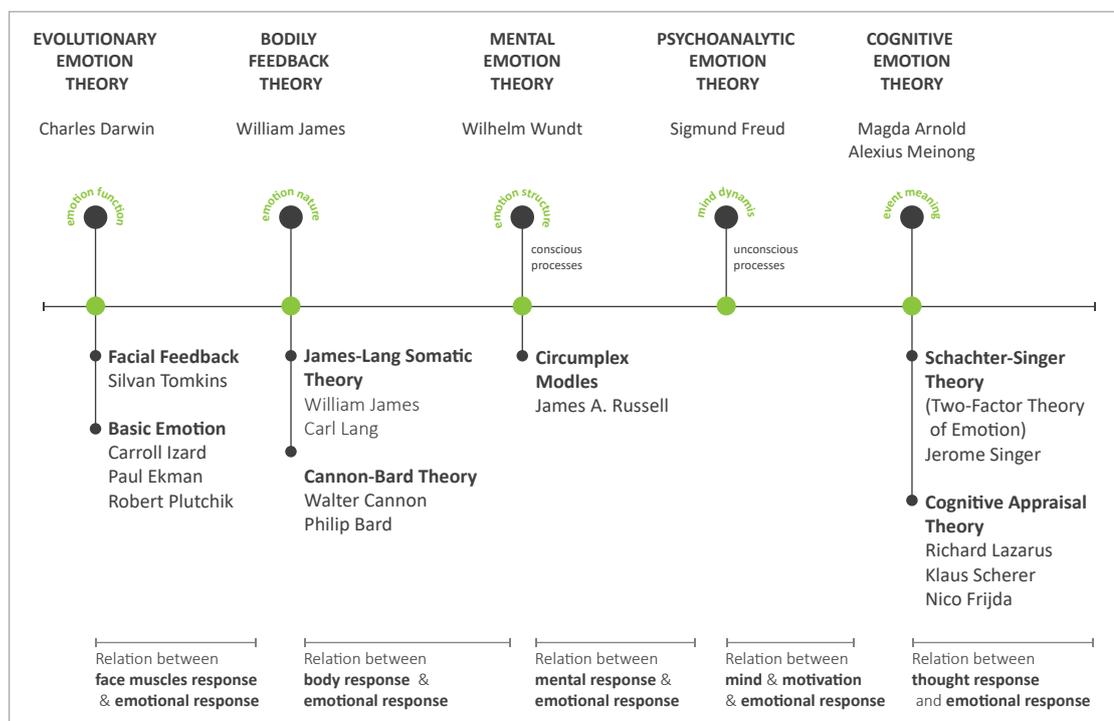


Figure 2-24 Emotion Theory Traditions.

### 2.3.3 Models of Emotions

According to the compensational model of emotions, emotional responses always begin with a relevant appraisal of the individual, leading to a significant emotional reaction (Lazarus, 1991; Mohammadi et al., 2019; Scherer, 1984). These emotional responses are multi-component phenomena including subjective experience presents the personal internal awareness and consciousness of the emotional state (Frijda, 1986); behavioural reaction that is triggered by emotions like creating the tendencies of approaching, avoiding, or attacking

(Arnold, 1960; Reisenzein, 2006); expressive reactions that involve the facial, vocal, and body expressions that come with emotions noting that each emotion has a specific pattern of expressions (Darwin, 1872; Ekman & Friesen, 1978), and physiological reactions include the body's physical response by the activation activate the autonomic nervous system, leading to changes leading to a change like a faster heart rate or sweating (Cannon, 1928; James, 1884, 1994). These responses can be understood and seen based on different emotion models.

Accordingly, emotion research is commonly classified into basic and dimensional emotion models, also known as categorical and dimensional models (Grekow, 2018; Karbauskaitė et al., 2020; Sreeja & Mahalakshmi, 2017). The categorical models classify emotions into discrete categories or types, each representing a qualitatively (certain numbers) of distinct emotions (Ekman, 1992b; Frank & Wilson, 2020; Izard, 1977, 1992; Plutchik, 1982). Conversely, the dimensional models understand and describe emotions by placing them on a scale or set of dimension axes (Judd, 1897; Reisenzein, 1992, 2000; Russell, 2009). Categorical models are rough sketches of emotions, while dimensional models are high-resolution emotional maps. Hence, both models reveal different individual, unique emotions and use the human mind to interpret the emotions (Sreeja & Mahalakshmi, 2017).

### *2.3.3.1 The Categorical Models*

Also known as the discrete emotions. In this model, emotions are described through a discrete set, labels, class tags, or adjectives of emotions, and distinctions between each emotion can be acknowledged based on compatibility with one or more of the emotion components, including experiences, physiology, and behaviour components (Desmet, 2002; Grekow, 2018; Mauss & Robinson, 2009; Sreeja & Mahalakshmi, 2017). Accordingly, several groups are created, and emotions are distributed among the proper discrete categories. Thus, this perspective can be divided into two sub-models: Circuit Models and Basic Emotion Models.

Arnold (1960) is considered one of the researchers adopting the circuit models approach along with (Cannon, 1928). They proposed that the neuro circuits are responsible for a specific emotion, and the differentiation between them with clear behavioural reactions. In contrast, basic emotion models, which are among the most widely used in emotion classification, align with circuit models in recognising specific adaptive emotions. Yet, these models categorise emotions within a limited range of 6 to 18 emotions, each defined by its unique emotion focusing on the facial expression components (Desmet, 2002; Scherer, 2000). By introducing emotion terms that define their function, historical significance, and universality across cultures (Darwin, 1872), psychologists began building upon this approach. Table 2-1 provides the most well-known basic emotion sets proposed by various influential psychologists based on their theories and studies of muscular changes, particularly facial expressions, that uniquely reflect different emotion states (Darwin, 1872; Ekman, 1973, 1992b; Ekman et al., 1972; Izard, 1971, 1977; Plutchik, 1980, 1982; Tomkins, 1963, 1984).

Table 2-1. Basic Emotions Sets.

| Emotion Theorist            | Emotion Sets  |
|-----------------------------|---|
| <b>Darwin (1872)</b>        | Anxiety, Grief, Dejection, Despair, Joy, High Spirits, Love, Tender, Devotion, Reflection, Meditation, Ill-temper, Sulkiness, Determination, Hate, Anger, Disdain, Contempt, Disgust, Guilt, Pride, Helplessness. |
| <b>Tomkins (1963, 1984)</b> | Anger, Disgust, Fear, Joy, Surprise, Contempt, Distress, Shame, Interest  |
| <b>Ekman (1973)</b>         | Anger, Disgust, Fear, Sadness, Surprise, Happiness  |
| <b>Izard (1971, 1977)</b>   | Anger, Disgust, Fear, Joy, Surprise, Contempt, Distress, Shame, Interest, Guilt   |
| <b>Plutchik (1980)</b>      | Anger, Anticipation, Joy, Trust, Fear, Surprise, Sadness, Disgust   |

Acknowledging that there are many basic models of emotions, one of the most popular known models under the categorical group is Plutchik's Wheel of Emotion (Figure 2-25), which offers a model consisting of both basic and complex categories covering the emotional dyads concept (Plutchik, 1980, 1982, 1991, 2001). Plutchik's model proposes that basic emotions can generate secondary emotions derived from the core set, illustrating the blending mechanism that explains a broader range of emotions beyond just the basic ones (Scherer, 2000). Accordingly, the intensity of these basic emotions leads to others (for example, anger is less intense than rage). Hence, the basic emotions serve as the foundation, representing universality and cross-cultural facial expressions among humans (Grekow, 2018).

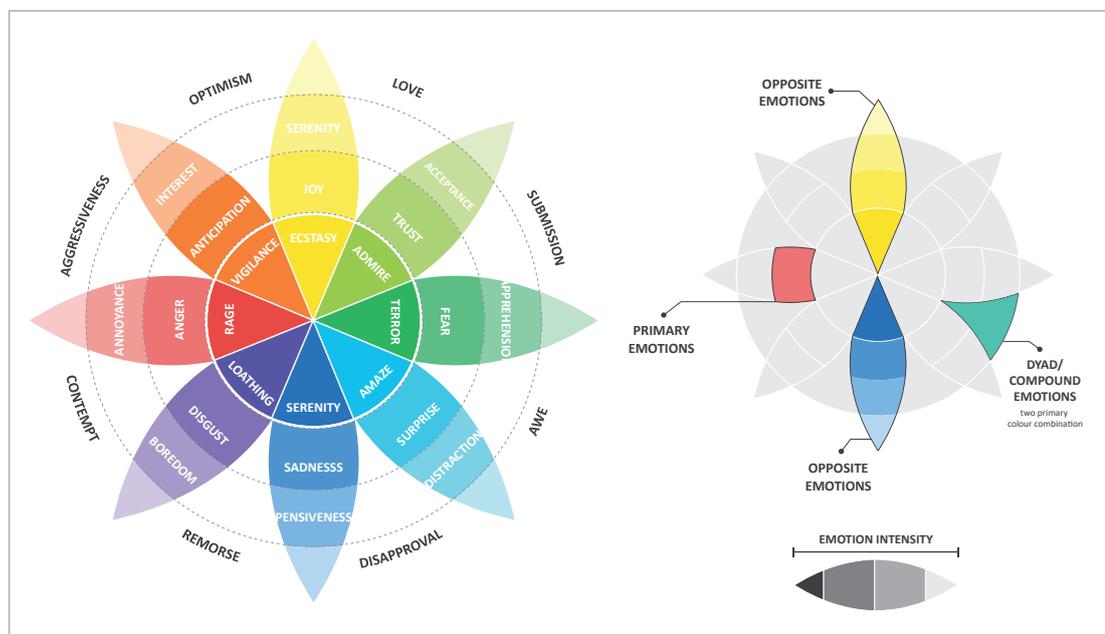


Figure 2-25. Representation of Plutchik's (1980) Wheel of Emotions.

### 2.3.3.2 *The Dimensional Models*

Models within this classification emphasise a dimensional approach to describing and differentiating emotions, primarily focusing on arousal, valence, and approach-avoidance (Mauss & Robinson, 2009). The arousal dimension reflects the intensity of emotional activation, ranging from low to high, while valence represents the emotional spectrum from pleasure to displeasure. Additionally, the approach-avoidance dimension captures the tendency to move toward or withdraw from a stimulus.

The pioneering work in dimensional theory is attributed to Wilhelm Max Wundt (Greenwood, 2003), who introduced three key emotional dimensions: pleasantness-unpleasantness, rest-activation, and relaxation-attention (Figure 2-26) (Diriwächter, 2021; Wundt, 1904). Moreover, the dimensional models include two sub-models: Unidimensional Models and Multidimensional Models. The key difference here is that the unidimensional approach understands emotions by using just one main dimension. This dimension could be how awake or excited someone feels (arousal) or how good or bad something feels (valence). Duffy (1941) focused on the arousal aspect of the emotions by measuring the level of excitement from low to high. In contrast, the popular model PANA, also known as Positive and Negative Affect Scales, focuses on the valence dimensions and believes that the most important dimension is whether something feels good (pleasant) or bad (unpleasant) (Watson et al., 1988). In contrast to the unidimensional approach, the multidimensional approach uses two or three dimensions to distinguish emotions. A well-known model that presents this perspective is the two-dimensional circumplex model of emotion, also known as the Circumplex of Emotion (Figure 2-26) presented by Russell (1980) where he positioned standard emotions within a circular or circumplex model, mapping them along two key dimensions: pleasantness to unpleasantness and activation to deactivation, in which the value of the emotion is changeable (Grekow, 2018; Scherer, 2000).

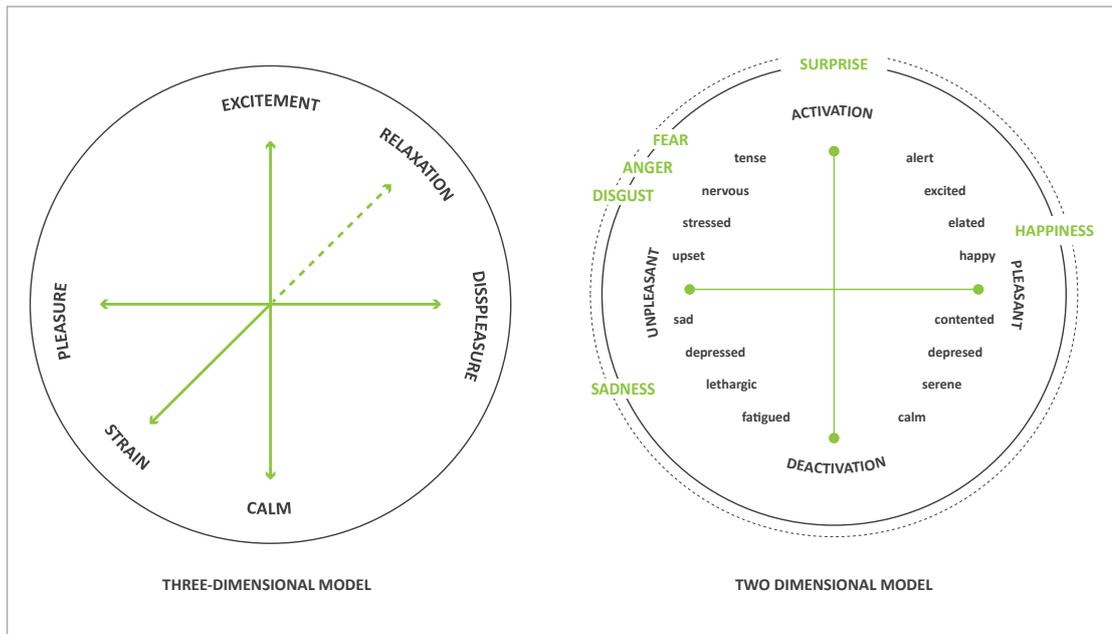


Figure 2-26. Representation Left: Wundt's (1922) Three-Dimensional Model of Feelings, Right: Russell's (1980) Two-Dimensional Circumplex Model.

In summary, categorical models are good for explaining specific emotions and their triggers, but they can be inconsistent. Dimensional models are simpler and more structured but may not capture the full complexity of emotions. As a result, componential models bridged the gap between previous models by focusing on how cognitive appraisals create emotions. First, they allow specific emotional patterns as presented by Scherer's component process model (Scherer, 1982a, 1982b). Scherer (2009) proposed that there are as many emotions as there are unique patterns of appraisal. This means emotions are highly specific and depend on how situations are evaluated. Furthermore, Frijda agreed that while there are no strict basic emotions, there are common emotional prototypes or families (Frijda, 1986, 1987). Second, they broaden the emotional themes as suggested by Lazarus's model, which focuses on how people appraise situations based on their personal significance and ability to cope (Lazarus, 1982, 1991). He suggests that a few core 'themes' in appraisal lead to a limited number of major emotions. This approach aligns with discrete emotion theories but adds more detail about how emotions are triggered (Scherer, 2000), offering a more detailed and flexible way to understand emotions.

As Haidt and Keltner (1999) suggested, integrating both dimensional and categorical perspectives can be beneficial to some extent. Their approach demonstrates that various dimensional combinations can effectively represent distinct emotions. Therefore, a single approach was not adopted; instead, different approaches were chosen based on this study's main objectives and procedures. Consequently, the first method employed in this research followed the categorical model, while the second study utilised the dimensional approach to define and develop the tracking tool.

### 2.3.4 Emotion Measuring

Numerous researches have focused on measuring emotions, especially within the realms of psychology and sociology (Desmet, 2018). However, comprehensively measuring emotions poses a challenge due to their multifaceted nature. It has been proposed that to capture emotions fully, research should encompass all changes occurring within the appraisal processes (Scherer, 2005). Yet, the selection of a method for emotional research depends on the specific goals of the study. Commonly employed methods, such as questionnaires and facial, physiological, and behavioural assessments, are susceptible to biases or may distort the research environment (Meiselman, 2015). Consequently, the complex nature of compound emotions necessitates a diverse array of measurement tools, which can be categorised into emotional expressions (patterns of facial and vocal expressions), physiological reactions, behavioural reactions (motivational changes), and subjective feeling states (Desmet, 2002; Scherer, 2005).

Yet, conducting such comprehensive measurements of emotions is challenging and is unlikely to become a standard practice in the foreseeable future (Desmet, 2002; Scherer, 2005). Therefore, research in this domain tends to focus on individual components that align with specific research requirements and objectives. Notably, no method is currently available to measure the subjective experience during an emotional episode (Scherer, 2005). Desmet's (2018) review of the literature on emotion measurement instruments identified two primary approaches:

- **Non-verbal instruments**, which concentrate on expressive (e.g., facial and vocal cues) and physiological components (e.g., heart rate). However, this approach is limited to the basic emotion paradigm (Desmet, 2018; Scherer, 2005).
- **Verbal instruments**, which focus on subjective feeling components, utilise a combination of emotion and scales to assess outcomes. Two response formats exist within this tool: a free response format, enabling participants to express emotions freely, and a fixed response format, presenting participants with a list of emotions to choose from (Scherer, 2005). Nonetheless, this approach may encounter cross-cultural challenges (Desmet, 2018).

However, other measurement tools are presented in *Table 2-2* below that illustrate the specific aspect that each instrument emphasises, whether it is an expressive reaction, a physiological reaction, a behavioural reaction, or a subjective feeling. Additionally, the table provides a clearer overview of the strengths and weaknesses of each approach, making it easier to understand the differences between them and strengthening the research approach by highlighting the subjective component as the primary aspect to be measured in this research.

Table 2-2. Simplified comparison of the three emotion-measuring approaches.

| Aspect               | Behaviour / Expression  | Physiological Reaction   | Subjective Feeling  |
|----------------------|---|--|---|
| Classification       | Non-verbal  | Non-verbal   | Verbal  |
| <b>Advantages</b>    | Naturalistic assessment, Simple measurement, Association with arousal, Cross-cultural recognition, Valence indication.  | Physiological basis, Specificity exploration, Excellent temporal resolution, Direct measurement of brain activity, High spatial resolution, Circuit identification.  | Validity in current emotional experiences, Insight into trait versus daily experience, Dimensional understanding. |
| <b>Disadvantages</b> | Limited sensitivity to valence, Complexity of emotion-expression relationship, Need for replication, Limited emotion specificity, Contextual influence, Methodological limitations. | Complexity of interpretation, Inconsistencies in findings, Sensitivity to non-emotional factors, Limited spatial resolution, Interpretational challenges, Confounding factors, Complexity of emotional reactions, Interpretational challenges, Methodological confounds. | Bias among certain groups, Individual differences in awareness, Challenge to emotion specificity.                 |

#### 2.3.4.1 Emotional Expression Tools

These tools were constructed based on the theory that posits emotions can be recognised through the analysis of vocal, facial, and bodily behaviours, thereby establishing a bridge for communication and action (Ekman, 1992b; Frijda, 1986). Tools under this category are divided into the following:

##### 1. Facial Expression

The foundation of these emotion assessments is derived from Darwinian concepts, which connect emotional behaviours to biological actions that serve the purposes of survival and communication structures of human beings (Darwin, 1872; Loewenberg, 1965; Mauss & Robinson, 2009; Plutchik, 1965). However, a prominent theory building upon Darwin's ideas is Ekman's Basic Emotion View (Ekman, 1992b; Tcherkassof & Dupré, 2021).

This Basic Emotion View suggests that facial expressions truly show how someone feels inside. According to this perspective, there are six basic emotions fear, anger, surprise, disgust, sadness, and happiness that everyone displays universally, and they're innate from birth (Ekman, 1992b). These six basic emotions are believed to genetically exist not only in

humans but potentially across different cultures and species, according to Ekman's research. Hence, emotions such as love, pride, embarrassment, and shame were considered part of the new development of the Basic Emotion View approach (Keltner et al., 2019; Tcherkassof & Dupré, 2021).

The analysis approach is divided into componential coding or Electromyography (EMG). The componential coding tools can analysis muscle movements such as the Facial Action Coding System (FACS), which assesses 44 distinct movements (Ekman & Friesen, 1978; Frank & Wilson, 2020; Mauss & Robinson, 2009; Tcherkassof & Dupré, 2021), while other analysis approaches depend on muscle contraction (Izard, 197; Mauss & Robinson, 2009). This approach can also be defined as the observer rating or receiver (Mauss & Robinson, 2009). In the (EMG), a more objective measurement is applied by using electrodes that record the electrical signals from the facial movement (Mauss & Robinson, 2009).

Studies reveal consistent correlations between facial cues and emotional valence, yet specific emotions remain ambiguous. Due to conflicting evidence, challenges emerge in directly interpreting facial expressions.

## **2. Vocal Expression**

People often turn to vocal cues to understand emotions. In studying acoustics such as voice, Amplitude measures the loudness of the voice, and Pitch measures the frequency of the voice (Juslin et al., 2005; Mauss & Robinson, 2009). However, discerning emotional valence through vocal cues remains challenging. Banse and Scherer's study revealed a multifaceted approach, combining acoustic properties to discern discrete emotions, emphasising the need for replication studies to confirm these findings (Banse & Scherer, 1996; Scherer, 1986; Scherer et al., 2001).

## **3. Body Expression**

While facial expressions lack consistent ties to specific emotions, other research suggests that emotions linked to social status are systematically associated with whole-body behaviours, offering promising avenues for further investigation. However, research in this area is limited but suggests that certain emotions have distinct bodily behaviour signatures that need to be investigated more (James, 1884; Lange, 1992; Wassmann, 2008).

### **2.3.4.2. Emotion Physiological Tools**

Tools in this category vary in their assessment methods, focusing on the physiological reactions triggered by emotional stimuli by examining peripheral functions. One prominent system utilised is the Autonomic Nervous System (ANS), which predominantly relies on electrodermal (sweat gland) or cardiovascular (blood circulatory system) responses such as heart rate (HR), blood pressure (BP), and total peripheral resistance (TPR) (Coppin & Sander, 2021; Larsen et al., 2008; Scherer, 2005). These responses are indicative of sympathetic or parasympathetic activation. These tools aim to discern specific patterns of ANS activation corresponding to various emotions, a concept initially proposed by James in (1884).

Alternatively, another approach to measuring physiological reactions to emotions involves focusing on the brain's involvement. Electroencephalography (EEG) is a well-established tool that enables the monitoring of activity in the left and right frontal brain regions, which are crucial for emotional processing. For more precise insights into brain activity, neuroimaging techniques like functional magnetic resonance imaging (fMRI) or positron emission tomography (PET) are employed. These methods provide detailed information about brain regions and their activation patterns in response to emotional stimuli (Mauss & Robinson, 2009).

In summary, tools in this category provide valuable insights into the activation patterns and responsibilities of different brain regions, shedding light on the physiological underpinnings of emotional experiences.

#### *2.3.4.3. Emotional Subjective Feeling Tools*

A significant aspect of emotion involves an inner state that can only be measured and understood through self-reporting methods. This necessitates individuals to verbally express or use rating scales to report their emotions (Desmet, 2018). Self-report measures of emotion are nuanced; their validity varies by timing and individual differences. Reports closer to the experience are more reliable. In the domain of self-reported emotions, it is quite clear that dimensions such as valence and arousal (Russell & Barrett, 1999) or tendencies toward approach and avoidance (Watson et al., 1999) capture the lion's share of variance. Indeed, the dimensional nature of self-reported emotional responses is so substantial that it has been suggested that the dimensional correlates of self-reported emotion be examined first before there is any legitimate claim to emotion specificity (Mauss & Robinson, 2009; Watson et al., 1999). Yet, biases exist, like social desirability and alexithymia, impacting even real-time reporting. Emotion research debates dimensional versus discrete perspectives, favouring dimensions like valence and arousal, which dominate self-reports (Mauss & Robinson, 2009; Robinson & Clore, 2002).

## 2.4 Design and Emotion

### 2.4.1 Emotion while Designing

Since the establishment of the Design and Emotion Conference in 1999 (Desmet & Hekkert, 2009), there has been a noticeable increase in interest and research dedicated to this topic, with a more focused approach that explores emotions within the design process. Hence, the design community and researchers have witnessed a growing number of frameworks that emphasise the impact of designed objects on consumers and explore ways to enhance this impact and emotional experiences, often with a strong focus on the end user (Forlizzi et al., 2003). However, this approach tends to create a one-sided understanding of design, prioritising audience needs and emotional responses and focusing less on the emotional experiences of designers themselves during the design process. Conversely, research suggests that emotional input within the design process is essential (Tang et al., 2021), playing a noteworthy role in problem-solving and decision-making (Ho, 2015; Park, 2004; Sas & Zhang, 2010). Therefore, designers need to focus on managing, regulating, and understanding their emotions.

Design, as Glanville (2006b) proposed, involves a self-conversation that underscores the importance of being receptive and listening. Design revolves around the conception and realisation of novel ideas, achieved through the combination of planning and crafting processes (Archer, 1979; Cross, 1982). Within this understanding, the emotionalised aspect of design, as highlighted by Ho and Siu (2012), emerges as a key component. Designers use their emotions to guide them toward solutions and reshape the design process (Cross, 1982; Crossley, 2003; Dybvik, 2022; Ho, 2014). Norman (2003) asserts that emotions employ significant influence in both design and intellectual thinking. Moreover, research suggests that emotions can enhance designers' ability to optimise their decision-making and outcomes during the design process (Ho, 2015; Tang et al., 2021).

Various studies have investigated the role of emotion within the design process (Desmet & Hekkert, 2009; Dorst & Cross, 2001; Forlizzi et al., 2003; Ho, 2014). The iterative nature of the design process encompasses exploration and experimentation cycles, often involving rejection and reiteration phases (Glanville, 2009) shaped by both external and internal factors, which are heavily influenced by emotion, subsequently impacting the design journey (Ho & Chau, 2016). Moreover, research indicates that emotions enhance information processing, communication, and categorisation (Park, 2004). Furthermore, emotions foster flexibility and the ability to establish connections, expanding one's scope of attention and action (Fredrickson, 1998; Isen & Baron, 1991). Emotions are the driving force behind engagement, motivation (Reeve, 2024), and excitement throughout the design process (Sas & Zhang, 2010). Desmet et al. (2023) introduces the concept of 'micro emotions' to inform design enhancements, aiming to enrich emotional experiences and inspire novel design inventions. However, the emotional experiences are not limited to positive experiences; they encompass a spectrum, including discomfort, displeasure, and neutrality, all of which influence the design process (Ho, 2010).

Exploring the connections between emotion, decision-making, and design in the students' design process within an educational context highlights a requirement to develop methods to report emotion during the design process. The necessity for such methods arises from the minimal investigation into how designers can comprehend and manage their emotional footprint (Norman, 2004).

#### *2.4.1.1 Emotion and Decision-Making*

Emotion as a consequence of decision-making has been explored in various studies, highlighting the impact on outcomes and subsequent behaviours (George & Dane, 2016). Moreover, the decision process stems from not only conscious rational activity that ultimately leads to the most suitable solution for the design problem (Lunenburg, 2010) but also includes making decisions between favourable and unfavourable, which are impacted by emotion as well (Ho, 2023). Van Dijk and Van Der Plight (1997) found that disappointment arises when outcomes fall below expectations, while elation occurs when outcomes exceed expectations. These findings have implications for decision-making in uncertain contexts, where unexpected outcomes can evoke strong emotional reactions (Van Dijk & Van der Pligt, 1997). Another interesting discovery by Damasio (2006) highlights several important aspects of the relationship between emotion and decision-making. First, emotion is essential for decision-making alongside reasoning. Second, individuals with prefrontal cortex injuries lack the emotional mechanisms necessary for making decisions. Third, emotional significance plays a crucial role in selecting one alternative among the various options processed by the brain. Judgments and choices are affected by emotions, which are considered to be the most impactful drivers of the individual's life decisions (Lerner et al., 2015). Hence, the individual emotions are also impacted by the decision's positive or negative outcome (Schwarz, 2000). A study by Wells and Iyengar (2005) demonstrated that decision-makers' perceptions of their consistency influence their effect and outcomes. Individuals who believed they were more consistent in their decisions experienced lower negative affect and more positive outcomes, even if their actual decisions were less consistent. Emotions have a significant presence in planning and information processing; therefore, there is a need to understand emotions to better regulate their influence on how decisions are made (Toda, 1980). While Isen (2008) emphasised the impact of positive emotion in facilitating problem-solving and innovative, efficiency, and thoroughness in decision-making by promoting more flexible thinking, Ratner and Herbst (2005) found that negative emotions from a bad outcome of a good decision can lead individuals to switch to inferior decisions, especially when focusing on their feelings. In contrast, Dane and Pratt (2007) focused on the intuition aspect of feeling stating that intuitions are rapid, nonconscious, and holistic judgments that emerge from associative processes, often accompanied by positive or negative emotions. While some intuitions are positive, other uneasy emotions can be negative but still catalyse actions (George & Dane, 2016). Overall, decision-making becomes heavily dependent on emotions when little information is available or when judgments are too complex to be made based on this amount of normal information (Brown, 2011).

To conclude the relationship between emotion and decision-making, Toda (1980) stated, "*Emotions are decision-making programs developed through evolution; they seem to have been particularly elaborated in human beings*" (Toda, 1980, p. 154). Given that, decision-making is an important aspect of the design process, built upon selecting the desired outcome from various alternative solutions. This means that decision is a combination of brain activity and emotional experiences (Ho, 2023; Lunenburg, 2010).

#### 2.4.1.2 Emotion and Design Process

In one hand, emotion is a fundamental component of common sense and thinking processes, helping us understand behaviour, decision-making, and action processes (Toda, 1980). The design process, on the other hand, consists of multiple layers of decision-making (Ho, 2023). Therefore, the connection between emotion, decision-making and the design process is obvious and strong. This connection arises from considering emotions as chemical and neural responses to stimuli, regulating both physical and mental states. They create associations between stimuli and emotional experiences, influencing how individuals perceive and react to similar stimuli in the future (Damasio, 2006). This has significant implications for decision-making, where emotions can profoundly affect judgments and actions (Biagioli et al., 2018; Nelson & Stolterman, 2003). Furthermore, designers, during their design process, are consistently dealing with ambiguity and uncertainty (Buchanan, 1992; Coyne, 2005; Jonas, 2007; Visser, 2010), which requires them to be open and willing to navigate trial-and-error phases of rejection and reinvention (Glanville, 2009); these kinds of situations are strong factors to create various emotional responses than stable situations (Mills & Kleinman, 1988).

Emotions serve multiple functions in the design process, including managing processes, directing actions, evaluating objects and events, and supervising a designer's inner state (Ho & Siu, 2012). Papanek (1971) emphasised the designer's role in sensing and feeling during the design process, noting that any change can significantly impact outcomes and ensure proper conduct (Norman, 2004). Research suggests that emotions can enhance designers' abilities to optimise decision-making and outcomes (Ho, 2015; Tang et al., 2021). Crossley (2003) explained that being emotionally attuned during the design process can enhance the empathetic approach and reinforce the design vision. Hence, designers employ emotions to reshape and assess the design process using them as a tool and method (Dybvik, 2022; Ho, 2014). In addition, emotions enhance the design process management by integrating more personal experiences and strong emotions during the process (Van Aken, 2005).

Researchers have developed various approaches to comprehend the part played by emotions in the different stages of the design processes. These processes undergo alterations and changes over time due to the designers' emotions being affected by internal and external factors (Ho, 2010). The effect of emotions on the design process includes fostering stronger relationships among team members, developing a deeper understanding of our own and others' experiences, and establishing a solid foundation for creating shared design goals

(Crossley, 2003). Also, designers' emotions and personal experiences significantly impact the structure and function of the design outcomes, in which the reflective emotional responses influence decision-making during the design processes (Ho & Siu, 2012). Research indicates that experienced designers with high emotional intelligence exhibit significant emotional involvement through the design processes, which contributes to their effective design process management (Sas & Zhang, 2010). In addition, Dorst and Cross (2001) refer to 'creative insight' as an important turning point where designers experience a highly emotional and impactful moment that transforms complex problems into simpler ones. In addition, studies showed that emotions could help make decisions by rechecking what kind of emotion was felt in a particular phase and revising if the solution was given to ensure it was the right one (Utriainen & Valtonen, 2022).

#### *2.4.1.3 Positive and Negative Emotions while Designing*

Emotional nature can be identified by two previously mentioned perspectives: 'natural-kinds' generated in the brain at birth or learned from the surrounding environment, also defined by its fixed emotion set (Ekman, 1973; Izard, 1977) and the 'psychological constructionist' that creates the emotional experience based on the neurobiological (Cannon, 1928) and psychological (Russell, 2003; Schachter & Singer, 1962) inherited system (Lindquist & Barrett, 2008). As a result, alterations in perception, decision-making, and behaviour and modifying cognitive thinking occur (Norman, 2004). Emotions are fundamentally governed by two neurophysiological systems: valence, which ranges from pleasure to displeasure, and arousal, which spans from activation to deactivation (Posner et al., 2005; Russell, 1980). These systems suggest that emotions can be conceptualised as combinations of valence (positive or negative) and physiological arousal (high or low) (Pekrun et al., 2007). Emotions arise from specific patterns in these brain systems, which regulate physiological responses (Posner et al., 2005). Pleasure here, derived from the French word 'plaisir', refers to the satisfaction of desires and is a key component of positive emotional experiences (Anderson, 2003).

The design process is connected to the designers' emotion (Forlizzi et al., 2003), and these emotions influence various phases of the design process, including information processing and decision-making, thereby affecting the designers' experiences (Ho & Siu, 2012). Understanding these emotional dynamics can help identify challenges at each stage and improve emotional management throughout a project. For instance, the Emotion-Driven Innovation (E-DI) process has been shown to inspire confidence and deepen emotional significance in idea generation, validating its effectiveness in fostering profound and innovative outcomes (Alaniz & Biazzo, 2019). Hence, individuals adapt their behaviours based on the emotions they experience, seeking positive experiences and avoiding negative ones (Patulny et al., 2019). Positive emotions, in particular, serve as catalysts for personal growth, enhancing individuals' capabilities and broadening their cognitive and creative potential (Fredrickson, 1998, 2001). Whilst, negative emotions enhance connections, help correct mistakes, confront problems and advocate for change (Martin, 2018).

In academic settings, students' emotions significantly influence their engagement, processes, and outcomes (Zhang et al., 2020). Positive emotions, such as joy, enhance cognitive content, promote divergent thinking and personal initiative, foster innovation, and improve creative problem-solving (Um et al., 2007; Utraiainen & Valtonen, 2022). Experimental studies have shown that positive emotions, such as happiness, create a positive valence that enhances idea generation, while negative emotions, such as anxiety, can hinder creativity by narrowing focus (Isen et al., 1987). However, negative emotions also spur creativity under specific conditions, such as challenging the status quo, though this often requires heightened emotional sensitivity (Utraiainen & Valtonen, 2022). Accordingly, emotions such as anger can enhance cognitive flexibility, abstract thinking, and enhance processing speed, stimulating the removal of obstructions, which is beneficial for problem-solving and achieving goals (Yang & Hung, 2015). Thus, both positive and negative emotions are critical to understanding the design process and should be considered in research (Pekrun et al., 2002b). Consequently, emotions play a role in the design process, shaping designers' responses to both internal and external factors (Ho, 2010).

### *2.4.2 Emotion in Education*

In the mid-to-late 1990s, conferences such as the American Educational Research Association (AERA) and the European Association for Research on Learning and Instruction (EARLI) had very few attendees in sessions focused on emotions in education (Pekrun & Linnenbrink-Garcia, 2014). However, this changed, and the interest in researching emotions in education has grown substantially, shifting from small, overlooked conference sessions in the 1990s to widely attended discussions in recent years.

The realisation of such needs arises from the deeply personal nature of students' educational journey, where they spend significant time working on projects, tasks, and submissions, making it no surprise that emotions play a significant role in the process (Schutz & Pekrun, 2007). Therefore, academic achievement and personal growth, both deeply intertwined with emotion, serve as both the experience and the tools that enhance flexible problem-solving and self-regulation. Additionally, emotions have a direct impact on students' academic performance, psychological well-being, and physical health (Pekrun et al., 2002a; Pekrun & Stephens, 2012). Rediscovering emotion in education (Maehr, 2001) includes investigating the effects of these emotions on perceptions, understanding, academic performance, and vice versa. As a result, educational decisions must be reflective and adaptive, considering these impacts on students. This requires ongoing review and adjustment to address the emotional dimensions in education (Griffiths, 1984) since emotions are unavoidable experiences (Maldonado et al., 2022). The design studio is an emotionally charged space where students experience academic, social, and personal emotions that impact their learning process. These emotions are created by study experiences, peer interactions, personal life, and tutor influence along the way (King & Chen, 2019), and this influence extends to illustrate how individuals memorise, understand, and make decisions regarding everyday challenges (Sven-Ake, 1992). Since education fundamentally involves learning,

which is a highly cognitive process, a study by Kremer et al. (2019) highlights the presence of emotion as an important factor that influences and enhances these cognitive processes within the learning educational experiences. This includes strong emotions, which are considered beneficial for learning as they enhance memory retention, regardless of whether the emotional experience is positive or negative (Sven-Ake, 1992). Similarly, complex and wicked problems often evoke a range of confusing emotions. While clarity, well-matched instruction, and comprehensive explanations can help reduce confusion. A study by D’Mello et al. (2014) highlights that such ideal conditions are not always available when tackling challenging problems. Instead, confusion plays a crucial role in the learning process, establishing deeper engagement and problem-solving skills.

Emotions in education are important for several reasons. Emotions impact attentions, motivations, and strategies students use while progressing in their studies (D’Mello et al., 2014). Emotion experiences are tied to goals, tasks, and interactions, affecting the flow, obstacles, outcomes, and accomplishments students experience (Pekrun et al., 2007). Since emotions are fundamental to human flourishing, education must address emotional well-being. Educating individuals to care for themselves includes understanding and reflecting on their emotional experiences, as self-knowledge encompasses emotional awareness (Griffiths, 1984). In conclusion, tutors are responsible for transferring knowledge, passionately inspiring their discipline, and creating a learning environment that encourages students to discover and explore their own emotions.

#### *2.4.2.1 Achievement Emotions as part of the Academic Emotions*

Academic emotions refer to the emotions experienced by students in educational settings, particularly during classroom instruction and academic performance (Pekrun et al., 2002a). Research consistently emphasises the importance of monitoring students' emotions and their impact on engagement (Altuwairqi et al., 2021). The importance includes various aspects of an individual's emotions, including learning content, knowledge generation, and social interactions within educational settings. Accordingly, academic emotions are classified into four categories: achievement emotions, social emotions, epistemic emotions, and topic emotions (Pekrun, 2006; Pekrun et al., 2002a).

Achievement emotions are specific emotional experiences tied to individuals' achievements or performance in various domains, such as academia, sport, work, or personal goals. As a subset of academic emotions, they are defined as emotions related to achievement activities and outcomes (Pekrun et al., 2002a). These emotions are closely linked to one's sense of competence, success, and progress toward achieving specific objectives (Pekrun et al., 2002a; Pekrun & Stephens, 2010, 2012) and are measured using the Achievement Emotions Questionnaire (AEQ) (Pekrun et al., 2011; Pekrun et al., 2005). The AEQ identifies 16 key emotions, categorised into activity emotions (experienced during learning activities) and outcome emotions (related to academic results). Outcome emotions are further divided into prospective emotions (anticipating results, such as hope, anxiety, and hopelessness) and

retrospective emotions (reacting to results, including pride, relief, and shame) (Table 2-3). These emotions are central to the Control-Value Theory (CVT) of Achievement Emotions, proposed by Pekrun (2006) which explains that academic emotions arise from two key psychological appraisals: subjective control (a student’s perceived control over their learning and achievement) and subjective value (the importance they assign to academic tasks and outcomes). Achievement emotions significantly impact motivation, learning, and overall well-being, making their study crucial for understanding students’ engagement and emotional responses to learning outcomes (Pekrun et al., 2007).

Table 2-3. A Three-Dimensional Taxonomy of Achievement Emotions (Pekrun, 2006; Pekrun et al., 2007).

| Object Focus | Positive*                     |                       | Negative**              |  |
|--------------|-------------------------------|-----------------------|-------------------------|--|
|              | Activation                    | Deactivation          | Activation              | Deactivation                               |
| Activity     | Enjoyment                     | Relaxation            | Anger<br>Frustration    | Boredom                                    |
| Outcome      | Joy, Hope, Pride<br>Gratitude | Contentment<br>Relief | Anxiety, Shame<br>Anger | Sadness<br>Disappointment,<br>Hopelessness |

\*Positive, pleasant emotion; \*\*Negative, unpleasant emotion

The significance of achievement emotions in education lies in their inclusion of object focus as a third dimension, alongside the traditionally recognised dimensions of valence (positive versus negative) and arousal (activating versus deactivating) (Watson et al., 1999). This combination creates a three-by-two taxonomy of achievement emotions (Pekrun, 2006). Object focus encompasses emotions experienced during active engagement in tasks, such as studying, researching, or designing, as well as emotions triggered by the results of one's efforts, such as progress, setbacks, successes, and failures (Pekrun, 2019). For example, students may feel curiosity and excitement when exploring new ideas, frustration when encountering challenges, or satisfaction when making progress. Similarly, they may experience joy and pride after successfully completing a project or passing an exam, while disappointment and anxiety may arise from failure or unmet expectations (Table 2-3). Control and value appraisals are critical in shaping these emotions, influencing students' learning, achievement, and emotional experiences. Different combinations of these appraisals (Schutz & Pekrun, 2007) predict the specific emotions students experience in academic settings.

The Control-Value Theory (CVT) provides an integrated framework for understanding emotions in academic contexts, emphasising that students' emotions are shaped by their perceived control over academic activities and the value they assign to these activities. The theory is structured around three core pillars: appraisals (control and value), achievement

emotions (activity and outcome-related), and their impact on learning and achievement (Pekrun, 2019). According to CVT, emotions arise when students feel a sense of control over their learning process and outcomes (control appraisal) or when they perceive the activity as meaningful and important (value appraisal). The framework categorises emotions based on valence and activation, with emotions like excitement and pride enhancing engagement and motivation, while emotions like anxiety and boredom may hinder progressing (Camacho-Morles et al., 2021; Pekrun, 2006, 2019; Pekrun & Stephens, 2012).

By integrating control and value appraisals, the Control-Value Theory (CVT) provides a comprehensive framework for understanding how achievement emotions influence learning outcomes, making it an invaluable tool for tutors aiming to enhance student engagement and achievement. Together, activity and outcome emotions demonstrate how emotions are deeply embedded in both the learning process and its results, shaping motivation, resilience, and the overall academic experiences. These emotional categories highlight the critical importance of recognising and addressing achievement emotions to enhance the learning environments and improve educational outcomes, ultimately contributing to students' academic success and well-being.

### *2.4.3 Design Education: at a Glance*

Design education began with the establishment of traditional crafts, where skilled artisans passed down their knowledge to the next generation, emphasising practical skills and craftsmanship, which can be considered as informal design education. Another early form of design education can be traced through the notes left by artists, documenting their making processes and techniques. Continuously, the evolution of education shifted from individual knowledge transfer to more institutionalised approaches, such as the Accademia delle Arti del Disegno in Florence, founded in 1563, which provided formal fine art instruction.

However, the formal concept of design education only emerged in the early 20th century, marking a significant shift towards a contemporary design education system (Findeli, 1995). Through industrialisation, design education evolved from craftsmanship and hand-drawing methods into a structured discipline. While early design movements like Arts and Crafts rejected mass production, the Bauhaus sought to merge art, technology, and education into a systematic design approach. These ideas influenced modern design education, though American schools prioritised practical applications over theory (Buchanan, 2009). A major milestone the Bauhaus created in the realm of design education, led by Walter Gropius, was introducing a curriculum that redefined design education. Moving beyond design as merely an art form, the Bauhaus established it as an independent scholarly discipline, paving the way for design to become a professionalised field and an academic subject (Meyer & Norman, 2020). Bauhaus also developed a design grammar based on visual language and human perception to guide the design process (Buchanan, 2009). Following the impact and demands of World Wars I and II, design boundaries were pushed further, leading to the development

of more specialised expertise and the emergence of distinct design disciplines (Findeli, 1995; Meyer & Norman, 2020).

Hence, the rise of design education as a distinct field gained momentum in the 1970s when researchers like Bruce Archer advocated for design as a third pillar of human knowledge alongside the arts and sciences (Archer, 1979). This perspective laid the foundation for integrating design into formal education, leading to the introduction of secondary school design courses in the 1980s in the UK (Archer et al., 1992; Trimmingham, 2008). Design tutors developed various design process frameworks with the goal of enhancing design education. These frameworks aim to help tutors refine their teaching methodologies, improve students' design capabilities, increase designers' awareness of their ability to apply strategic approaches to design activities, and support managers in effectively guiding designers (Lawson, 2004a; Norman, 2005). According to Jones (1980) design is both a way of thinking and a method for building new things and authentic design education should integrate both theoretical understanding and hands-on practice. Moreover, students learn problem-solving skills by engaging in a structured but flexible design process, allowing solutions to emerge from students rather than being dictated from above (Brown & Wyatt, 2015). Given that, design education develops technical and non-technical skills that apply across subjects. Design enhances higher-order thinking, adaptability, and innovation, making it relevant for the modern workforce and interdisciplinary learning (Berk, 2016). Further, designers often approach their work as problem-solving rather than mere decision-making, a perspective that can help bridge the gap between design education and professional practice (Almendra & Christiaans, 2009).

Another key advocate for design education is Schön (1992b), who argued that education itself should be shaped around the principles of design learning. He emphasised that design education fosters critical skills such as reflection, adaptability, and problem-solving, which are qualities essential for navigating real-world complexity. Schön sees reflection as part of the practice itself, where designers think and adapt while working, not in a detached way. This leads to the introduction of different educational models, such as design studios (Schön, 1987). Schön views design tutors as coaches who guide students from being novices to skilled designers. Tutors must demonstrate techniques, personalise instruction, and support students as they navigate learning challenges by doing. A key aspect of Schön's perspective is the importance of managing the emotional challenges of the learning process. Since novices often lack both the necessary skills and vocabulary, they frequently experience frustration (Ho, 2023). Design tutors are crucial in guiding students through these emotional hurdles while helping them develop their abilities (Waks, 2001).

Despite over seventy years of formal design education, Levy (1990) stated that design education must evolve to address the complexities of industrial and post-industrial societies by encouraging a deep understanding of ethical, technical, social, political, economic, environmental, historical, and cultural dimensions. On the other hand, Pavlova (2005) discussed that the formal knowledge which depends on theoretical learning for structured

action and the epistemological knowledge which depends on practical, hands-on learning by doing are essential in education. Unfortunately, design education rarely provides students with opportunities to engage with ill-defined problems, making it difficult for them to adapt to the complexities of real-world challenges (Jonassen, 2000). In addition, these real-world challenges involve emotional aspects that students often lack experience in handling (Ho, 2023), which in turn impacts their decision-making loop of being paralysed or avoidance. As a result, design students may develop complex relationships with their projects, particularly when confronting wicked problems and issues that are inherently multifaceted and resistant to straightforward solutions (Biagioli et al., 2018).

Given that, the power of education and design tutors lies in teaching students how to think critically and become better problem solvers with a meaningful purpose (Jonassen, 2000). Universities should focus on generating liberating knowledge independently (Levy, 1990). Difficulties faced by design students due to their lack of expertise in design judgement and process management encourage design tutors and researchers to develop strategies to help students improve, but acknowledge that challenges still exist (Ho, 2023). Teaching designers to recognise and manage emotions techniques could improve their ability to handle the design process effectively. As previously highlighted, the design process is rooted in problem-solving and involves multiple layers of decision-making. This highlights the critical role of emotion in the overall design education experience. Recognising and understanding one's emotion throughout the design process is essential for personal growth and effective decision-making.

#### *2.4.4 Exploring Emotional Dimensions in Students' Design Process*

Previous research on emotion has primarily focused on two main dimensions: valence (the positivity or negativity of an emotion) and arousal (the intensity or activation level of that emotion) (see 2.3.3.2, pp.107). However, studies exploring emotion in educational contexts have introduced a third dimension; the object focus, which distinguishes between emotions related to students' activities, such as the process of learning or creating and those linked to their achievements, such as progress or outcomes (see 2.4.2.1, pp.118). This expanded perspective is particularly relevant to design education, where the design process is inherently uncertain, iterative, and personal. Each designer engages with the process differently, experiencing a unique emotional journey that cannot be fully captured by valence and arousal alone. By considering the object focus dimension, research can better account for the complexity of emotional experiences in the design process, where both the act of designing and the self-reflection towards the achievements evoke distinct and deeply personal emotional responses.

A widely recognised framework for understanding emotions in education is the Control-Value Theory of Achievement Emotions (Pekrun et al., 2007). This framework introduces the third dimension (object focus) that helps explain how emotions relate not only to outcomes but

also to the learning process itself. The framework provides a valuable perspective for exploring emotions in educational settings (see Table 2-3, 2.4.2.1, p.119). Theoretically the framework is linked to Russell's Circumplex Model of Affect (Figure 2-26, 2.3.3.2, p.108), which defines emotions based on mixtures of different degrees of positivity or negativity and engagements or intensity (activation) of the emotion presented by two neurophysiological dimensions: valence (ranging from pleasure to displeasure) and arousal (ranging from high to low) (Russell, 1980, 2009). For instance, when you feel joy, it triggers a strong reaction in the part of your brain that processes pleasure and a moderate response in the part that regulates arousal. Other emotions also result from similar activation patterns in these two areas, as well as how you interpret and label your physical sensations (Barrett & Russell, 1999). This means emotions come from specific activation patterns in these brain systems that regulate our responses (Posner et al., 2005). However, this research builds upon adopting Pekrun's framework to incorporate an additional dimension beyond valence and arousal, providing a more comprehensive understanding of design students' emotional experiences during the design process.

#### *2.4.4.1 Valence and Arousal Dimensions*

Emotion research is often divided into two main approaches: categorical and dimensional models (see Figure 2-25, 2.3.3.1, p.106 and Figure 2-26, 2.3.3.2, p.108). Categorical models group emotions into distinct types, such as happiness or anger (Ekman, 1992b; Frank & Wilson, 2020; Izard, 1977, 1992; Plutchik, 1982), while dimensional models represent emotions along scales, such as valence and arousal (Judd, 1897; Reisenzein, 1992, 2000; Russell, 2009). In simple terms, categorical models offer a broad overview of emotions, whereas dimensional models provide more detailed emotional mapping

For this research, both models were utilised, with a greater focus on the dimensional model approach incorporating valence and arousal, which is essential for understanding students' emotional experiences throughout the design process. However, because of the dimensional models strength in capturing the essence of emotions (Watson, 2000), they are preferred as the primary models used within the main study of this research.

#### 2.4.4.2 Activities and Achievements Dimensions

The design process follows specific practices, rituals, and meanings that shape how designers learn, understand, and approach their work (Cross, 2007). Likewise, emotion shapes individual actions, interactions, and behavioural development, influencing various aspects of human experiences (Izard, 2010). In the context of design, whether viewed as a process or an achievement during the process, the act of design encompasses a blend of knowledge, experiences, and skills embedded in actions of planning, inventing, making, and doing (Archer, 1979; Lawson, 2005). The iterative nature of the design process involves continuous decision-making and problem-solving, where emotions influence both the journey and the results (Ho, 2015; Sas & Zhang, 2010).

Since this PhD research aims to explore the emotional experiences of design students throughout their design process, the study focuses on the emotions that arise both during their design activities and as they achieve outcomes. This distinction helps to track how emotions shift across different stages of the design journey and how they influence both practice and goal setting. While traditional emotional research often focuses on two dimensions, valence (positive or negative feelings) and arousal (intensity of emotion), this study adopts the Control-Value Theory of Achievement Emotions by Pekrun et al. (2007), which introduces the third dimension: object focus. This third dimension is especially valuable in the context of design education, as it can be used to distinguish between emotions tied to the act of designing and those related to students' reflection on their achievements. The framework aligns well with this research, offering deeper insight into how students' emotions are shaped by their sense of control over design tasks and the value they assign to their outcomes within the university setting. Thus, the orientation is explained as follows:

- **Activities: Process-Oriented Emotion**

Emotions are based on how much control students feel over the task and how meaningful they find the process (Pekrun & Linnenbrink-Garcia, 2014). This level of investigation includes the intangible experiences, including hands-on activities, engagement, and iterative process that students experience while working on design tasks; emotions at this level are important in shaping motivation, engagement, and persistence throughout the design process.

- **Achievements: Outcome-Oriented Emotions**

Positive emotions (e.g., relaxation) emerge when students feel control over success, while negative emotions (e.g., frustration) arise when perceived control is low or expectations are unmet (Pekrun & Linnenbrink-Garcia, 2014). This level of investigation includes the tangible experiences and the evaluative aspects of the design process, such as completing a prototype, receiving feedback, or presenting final work; emotions at this level.

## 2.5 Summary and Gap in Knowledge

In conclusion, this chapter has focused on two main areas: emotions and the design process. Firstly, all the design process frameworks presented in this section can, in general, go under two categories. First, the descriptive frameworks that usually describes the sequence and pattern of the design process activity by focusing on the solution nature of the design strategies such as Fuller (1957) and Simon (1969). Second, the prescriptive frameworks that are concerned with adaptation to improve work through a systematic and algorithmic approach to create a specific design methodology Jones (1980) and Archer (1965) (Cross, 2000). The key takeaway from these various design processes highlights a common underlying principle; design is fundamentally a human-based activity (Cross, 1992; Cross et al., 1997; Jonassen, 2000; Silber, 2007). While it is a distinct discipline, it should be clearly differentiated from art and science. In addition, across these models, design is consistently seen as a process rooted in two core elements: addressing ill-defined problems and relying on decision-making shaped by the designer's way of thinking, which are strongly impacted by the designers' emotions. Research has consistently demonstrated the critical role of emotion in shaping human actions. Various psychological theories highlight how emotions influence decision-making (Damasio, 2006; George & Dane, 2016), problem-solving, and the ability to confront everyday challenges (Lawson, 2004b). Emotions are not merely reactive states but are deeply integrated into cognitive functions, shaping perception, attention, and memory (Frijda, 2005; Lambie & Marcel, 2002). Additionally, emotions drive motivation, impacting how individuals engage with tasks, persevere through difficulties, and develop resilience in uncertain or complex situations (Maehr, 2001).

Beyond theoretical insights, research has explored different methodologies to measure and understand emotions, from physiological indicators and behavioural observations to self-report assessments (Mauss & Robinson, 2009). However, studying subjective emotional experiences and how individuals personally interpret and internalise their emotions remains in its early stages. While significant progress has been made in recognising the role of emotions in learning and decision-making, there is still a critical gap in understanding how individuals consciously experience, process, and utilise their emotions in real-world contexts (Maldonado et al., 2022). Moreover, emotions' impact is extended and studied within learning and education. However, even their significant aspect in impacting students' educational journey was neglected for a long time (Schutz & Lanehart, 2002) due to the focus of most research on the cognitive aspect of education. There has been a lack of studies on emotion within the educational setting, and further research is needed to explore this area in greater depth (Pekrun & Linnenbrink-Garcia, 2014). Moreover, there remains limited research on how emotions manifest in design processes, their overall impact, and how task-specific appraisals relate to students' emotional experiences (Ahmed et al., 2010; Ho, 2015).

Although design processes have acknowledged the role of the designer as a central and distinctive element within the process, especially when compared to other disciplines, they have often missed key factors related to these processes. The first is the time (Galdon, 2025), and the second is designer emotion. The designers' emotional experiences throughout the process are rarely considered, despite their significant impact on decision-making and problem-solving. Therefore, emotion investigation is important because subjective emotional awareness allows designer and more specifically design students to develop emotional intelligence, enhance self-regulation, and make more informed choices about their responses to challenges during the design process.

### *2.5.1 The Gap between Emotions and the Design Process within Design Education*

The design process is inherently rooted in problem-solving and decision-making. This process requires designers to navigate uncertainty, generate creative solutions, and make informed choices (Hammer & Reymen, 2002). Research has increasingly demonstrated a strong connection between decision-making, problem-solving, and emotions, highlighting that emotions play a fundamental role in shaping design processes, engagement, and enhance the process management (Ho, 2010). Despite this, design education and existing design process frameworks fail to acknowledge or integrate emotions as a component of the process, leaving designers, particularly novice students, without the necessary tools to understand, manage, and harness their emotional experiences effectively. Emotions, both positive and negative, influence how design students engage with challenges, reflect on failures, and iterate on ideas. Research has shown that emotions impact on motivation (Maehr, 2001), activity and outcomes (Pekrun, 2006; Pekrun et al., 2002a), which makes them essential in an iterative process like design (Ho & Siu, 2012).

Moreover, despite the longstanding recognition of emotions in academic contexts (Pekrun & Linnenbrink-Garcia, 2014; Pekrun & Stephens, 2012) and their presence in learning; design research has largely overlooked how emotions shape the design process of design students (Ho, 2015). Furthermore, design methodologies emphasise approaches to solve problems; they do not address how designers' emotions influence their ability to make decisions, take creative risks, or persevere through ambiguity (Biagioli et al., 2018). This lack of emotional consideration is particularly challenging for novice designers (students), who often struggle with self-awareness and emotional regulation when faced with design challenges (Ho, 2023). Without prior experience in managing frustration, confusion, or self-doubt, many design students struggle to navigate setbacks, affecting their confidence, creativity, and decision-making capabilities (Ahmed et al., 2010; Tang et al., 2021).

### *2.5.2 Conclusion: The Need for more Emotional Care in the Design Process*

In summary, while emotions are recognised as essential in learning, decision-making, and problem-solving, they remain largely unaddressed in design education and existing design process frameworks. Novice designers, in particular, lack the experiences and strategies to manage their emotional responses, leading to struggles with uncertainty, frustration, and creative blockages. This research highlights the need to develop design methods and tools dedicated to integrating emotions as an essential part of the process, encouraging students to engage with both positive and negative emotions productively. By reframing emotions as assets rather than obstacles, this research aims to broaden the scope of design education and practice, fostering more resilient, adaptive, and emotionally aware designers. In doing so, it sets the foundation for starting a conversation, one that fully acknowledges the intertwined nature of emotions, problem-solving, and decision-making in the pursuit of more innovative and meaningful design processes and solutions.

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*This chapter presents and justifies the research methodology, detailing a mixed-methods approach used across exploratory and validation phases. It introduces research tools including the EmotionProbe, Emotion Tracker, questionnaires, and interviews to investigate students' emotional experiences throughout their design journey. The chapter also concludes with the Angry Design Workshop, conducted to evaluate and validate the study's findings.*



03

CHAPTER  
THREE

METHODOLOGY

## 3.1 Introduction

This chapter outlines the methodology employed to gather data and facilitate the analysis. Consequently, this research endeavours to address a fundamental question central to the main title of this research:

### **Is Design Delightful?**

The literature review forms the basis for understanding the research done on emotion and design. Despite the significant advancements in both fields highlighted through this review, a gap was identified: **Although the design process shifted to centre on the designers and acknowledges their unique approaches, there is a noticeable lack of exploratory studies that examine the emotions experienced during the design process from the designer's perspective. This gap is even more pronounced among novice design students during their design journey.**

Therefore, the main research question aims to examine how different emotions manifest themselves in the students' design process stages, offering insights not only into whether the students' design experiences are pleasurable or unpleasurable, but also, beyond this, the emotional phenomena that design students experience as they progress with their design project. Hence, the emotional experiences here refer to any emotion that encompasses a range of pleasure, displeasure, neutrality, or any other new states. Noting that these emotional experiences can be influenced by various internal and external factors (Ho, 2010) and conceptualised as combinations of varying degrees of positivity or negativity and activation or deactivation (Russell, 1980).

Accordingly, this research aims to conduct exploratory studies that investigate design students' emotional experiences during the design process. The first part explores the emotions as students engage with the design process. This is followed by a verification part, in which professionals and academics provide their perspectives and feedback on the findings from the exploratory phase. Given that, three questions have been identified, guiding the research methodology and shaping the investigative approach (Figure 3-1). The study's main research questions, each of which was broken down into several sub-questions, are as follows:

#### **RQ1. What emotional experiences do design students encounter throughout the design process?**

*RQ1.1. What range of emotions do design students identify when designing?*

*RQ1.2. How do different emotions manifest in the students' design process?*

*RQ1.3. Are the students' emotional experiences pleasurable or otherwise?*

*RQ1.4. What are the dominant emotions experienced by design students?*

*RQ1.5. What significant emotional phenomena can be found in the design process?*

*RQ1.6. What is the meaning of emotions from the design students' perspectives?*

## **RQ2. How do the design students' emotional experiences affect their design process?**

*RQ2.1. What are the relationships between students' emotions and their design process stages?*

*RQ2.2. How are emotions and design process stages distributed throughout the design process?*

*R.Q2.3. What are the factors impacting students' design process?*

## **RQ3. How can the emotions of design students be effectively incorporated into their design process journey?**

*RQ3.1. What is the usability and reliability of emotion tracking tools during the design process?*

*RQ3.2. How can we promote the employment of emotion in design education?*

*RQ3.3. What strategies can be employed to incorporate emotion in the design process?*

*RQ3.4. How can design tutors create a space for students to explore their emotions productively?*

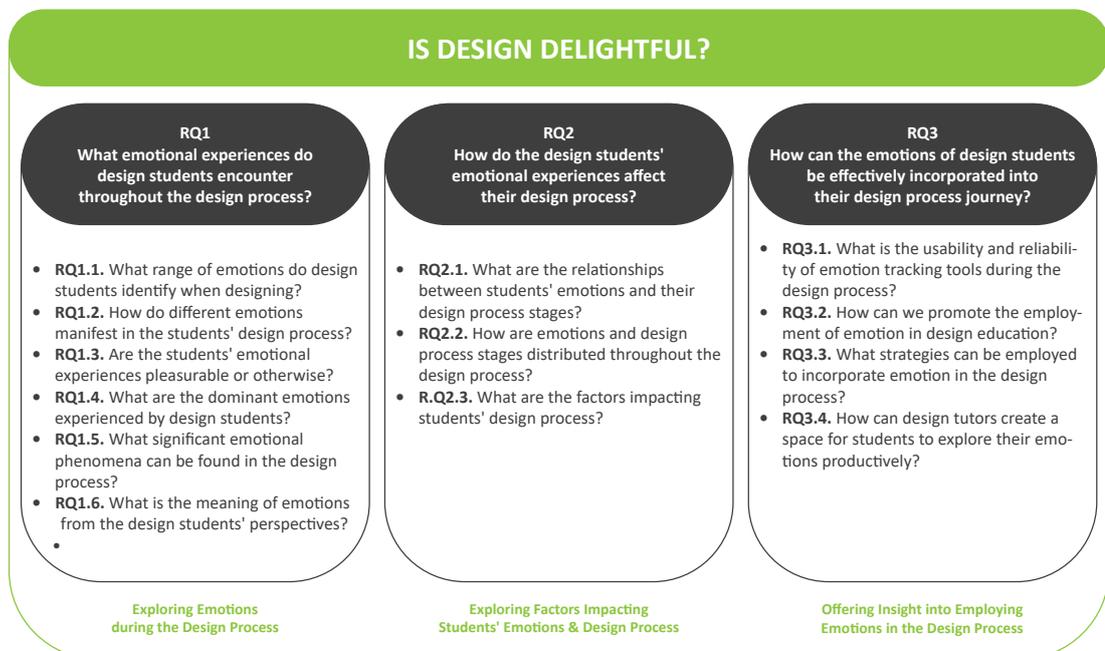


Figure 3-1. Thesis Research Main Questions and Sub-questions.

Two distinct student groups from Jordan and Scotland are presented in this research, reflecting the diversity of different ways of exploring and experiencing design (Glanville, 2023). Jordan offers research into designers with contested identities, being the top refugee-hosting country (De Bel-Air, 2016), which supports diversity and creates a unique backdrop for experimentation. Scotland, on the other hand, is a highly research-intensive country, resulting in tangible improvements to society and people's lives, thus delivering significant public value (UKRI, 2023). In addition, the verification stage includes design tutors, researchers, and professionals to offer broader perspectives on the findings from the

exploratory phase. Their involvement ensures that the results are not only grounded within the sample included in the research but also resonate with the broader design education and industry contexts.

Accordingly, this chapter is structured based on two parts as follows:

**Part One:** This part includes the study exploration stage. The first section illustrates the development of the EmotionProbe as the preparatory tool used in the preliminary study. Subsequently, the second section introduces the Emotion Tracker, which was conducted over a year. Both data collection tools were custom designed to document design students' emotions during various stages of the design process over different design project periods. To complement the Emotion Tracker, a feedback sheet was used as a questionnaire to gather additional insights into the factors influencing students' emotional perspectives and the meanings they ascribed to their experiences. Additionally, semi-structured interviews were conducted to explore the emergence of specific emotional phenomena that were reported during the tracking period.

**Part Two:** This part covers the verification stage, which follows the completion of the preliminary and main studies. At this stage, a focused group design workshop was conducted, bringing together design tutors, design researchers, and design professionals. The purpose of the workshop was to critically reflect on and discuss the findings that emerged from the exploratory studies in part one. By involving experts with diverse backgrounds and experiences, the verification aimed to evaluate the relevance and to suggest potential applications concerning the results within educational design contexts. Their insights offered valuable external perspectives that helped to strengthen the study's conclusion and added value to the academic research perspectives from real-world practice perspectives.

## 3.2 Methodology Rationale

In order to address the research questions, the exploratory research uses a mixed-method data collection approach. The use of a mixed-methods approach in this research is grounded in the understanding that no single method is sufficient to capture the full complexity of the phenomenon under investigation. Easterby-Smith et al. (2002) discussed the importance of using a combination of techniques in the research methodology to investigate the intended situations, with the importance of methodological pluralism to suit both the research questions and research aims (Arksey & Knight, 1999). Given this, the reason for using mixed methods in this exploratory study is to gain a comprehensive understanding of design students' emotional experiences, leveraging the characteristics of both quantitative and qualitative research strategies.

As Bryman (2012) notes, quantitative and qualitative approaches differ not only in their foundations but also in their orientation toward theory, data collection, and the interpretation of social reality. Quantitative methods allow for the collection of measurable

data that can be systematically analysed to test assumptions and explore relationships between variables, particularly useful for identifying patterns of emotions across the design process. However, qualitative methods, emphasising words and meaning-making (Clark et al., 2021), are equally essential for exploring how students interpret and make sense of their emotional experiences. This dual approach acknowledges that while emotional responses can be quantified, they are also deeply subjective and context-dependent.

In light of the fact that design research often stems from curiosity-driven questions arising from the researcher's observations (Rodgers & Yee, 2023), a range of fundamental data collection methods, including observations, probes, interviews, and questionnaires, were employed, each offering distinct advantages. Observations are valuable in understanding real-world behaviours within the environments, while interviews and questionnaires help uncover deeper insights into students' processes and perspectives. Each method complements the other, where the questionnaires can complement the probes to help identify broader patterns that may be further explored through the interview method. Concerning this research, the mixed method approach has been employed by four main research method tools (Figure 3-2):

1. Cultural probes were used as the main research tools with two distinct groups of design students from Jordan and Scotland. Each probe was tailored to students at different stages of their academic journey and project timelines, including short-term and long-term design projects. Given that the design students come from diverse cultures, backgrounds, design skills, and experiences, this helps in understanding emotional experiences at different levels.
2. Questionnaires of a representative sample of 39 respondents from Jordan and Scotland.
3. Semi-structured interviews were conducted with 13 students, selected from participants who had used the cultural probe in the second phase of the study and completed the questionnaire. During the interviews, the interviewer took additional notes to capture further insights into the emotional aspects of the design process, particularly those that emerged spontaneously through students' elaborations beyond the prepared questions.
4. Focus groups and a workshop were conducted. The sample group consisted of eight members, including design researchers, tutors, and professionals with experience in design. The purpose of these sessions was to validate the study findings and gather second opinions from experts. Participants came from diverse design backgrounds and level of experiences, providing a range of perspectives relevant to the design discipline.

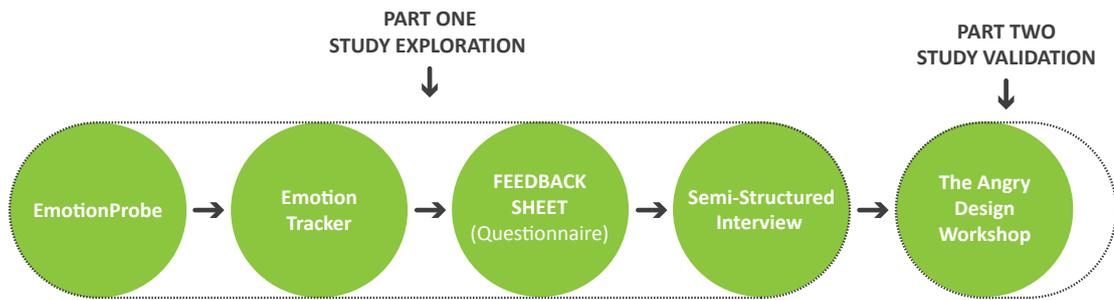


Figure 3-2. Research Mixed-Methods Tools Sequence.

Combining both strategies enhances the reliability and richness of the findings, thereby increasing the study's depth. Quantitative data ensures structure and comparability, while qualitative insights provide contextual understanding. In line with Bryman's opinion, the mixed methods approach offers a balanced and flexible research strategy, well-suited for exploring complex and evolving phenomena (Bryman, 2012) such as emotion in design.

### 3.2.1 Probe as a Subjective Emotion Reporting Tool

Significant progress has been made in the field of emotion research, particularly in psychology and sociology, but emotion tools, especially in the context of design, have lagged behind (Norman, 2004). Hence, there is a pressing need for tools that use existing literature to explore design students' emotions during their design process. As discussed earlier (see 2.3.4, pp.109), various tools for investigating emotions were mentioned (Figure 3-3), with their advantages and disadvantages outlined. This review provided a strong foundation for adopting cultural probes as the primary method for capturing subjective emotional experiences, which aligned with the consideration of the probes as a strong tool that enriches the design researchers' inspiration, collects valuable data from the participants themselves, and creates a strong connection between the participants and the design researcher (Mattelmäki, 2005). Additionally, the emphasis on the effectiveness of cultural probes in eliciting rich, personal, and contextual insights is particularly well-suited for exploring subjective experiences. Furthermore, cultural probes were selected for their ability to capture the emotional landscape of design students as they engage in the design process.

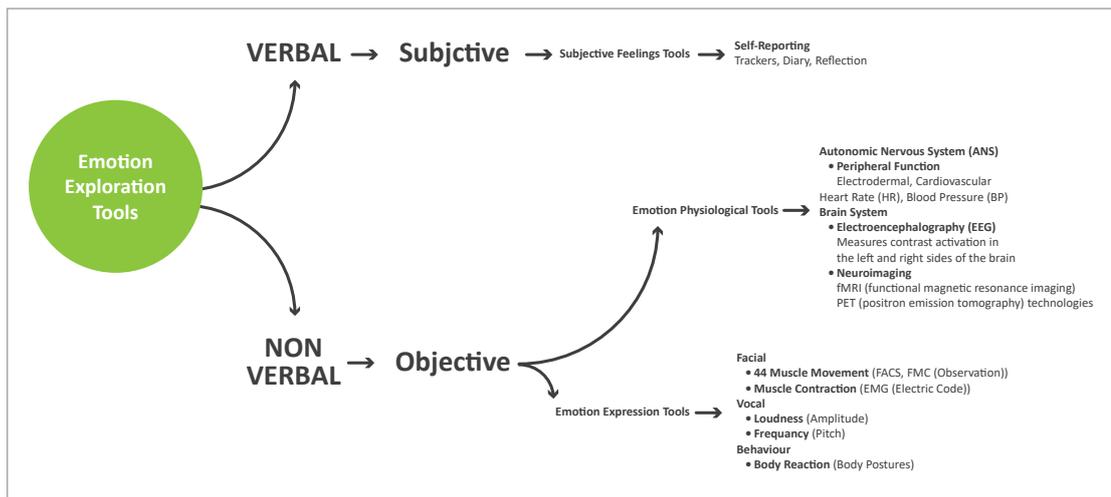


Figure 3-3. Emotion Exploration Tool.

Given that, design researchers have always been motivated to create tools to enhance their understanding of intangible experiences (Gaver et al., 1999; Hemmings et al., 2002). Probes are tools explicitly designed to gather such information and reflections, including experiences, feelings, attitudes, and actions within a specific context and based on the research purposes (Mattelmäki, 2008). Probes are a creative self-documentation tool that helps explore new opportunities and break the boundaries with minimal disturbance (Milton & Rodgers, 2013). Including different tools, instruments, and objects designed to fulfil a task, assignment, or activity based on the research aims and objectives, probes aid in gathering data from various real-time scenarios, thereby enhancing the credibility, reliability, transparency, and integrity of the collected data and context-related experiences (Brown et al., 2000; DeLongis et al., 1992). Additionally, Probes reduce researcher bias and allow for the conveying of more informative content (Carter & Mankoff, 2005). Thus, inspirational responses can be generated by gathering clues from people's lives and thoughts. Conversely, these tools encounter weaknesses; considerably, the data can be excessively vague and scattered, featuring an overly expansive scope that renders it unsuitable for making specific design decisions (Mattelmäki, 2006). In addition, probe-based context evaluation lacks control over participant responses, potentially resulting in few or no returned probes and costly investments with minimal results. Success depends on the initial relationship between the designer and participants, and designers can only access what participants allow, without the means to verify response validity (Townsend & Patsarika, 2022). In addition, Probes are like a way to ask questions; when people use them, their answers are shaped by their understanding. Designers later made sense of these responses independently, but the instruction didn't consider factors like culture, context, or communication (Townsend & Patsarika, 2022).

### *3.2.2 Questioners as a Practical, Reliable, and Structured Emotional Tool*

The use of an online self-completion questionnaire in this research is justified by its methodological appropriateness, practicality, and ability to generate reliable, structured data aligned with the study's aims. As Clark et al. (2021) note, such questionnaires are concise, easy to follow, and minimise the risk of incomplete responses by using predominantly closed questions that participants can complete quickly. This clarity was essential in ensuring that novice design students could engage meaningfully without feeling overwhelmed, thereby improving response quality. Moreover, the questionnaire enabled data to be collected at a single point in time across multiple variables, providing a snapshot that could be analysed to identify patterns, relationships, and associations among emotional and design-related factors (Bryman, 2012).

Using a digital format also provided significant advantages in flexibility and participant comfort. It allowed students to complete the survey at their own pace and in their preferred environment, reducing external pressure and encouraging honest, reflective responses (Bryman, 2012). For example, the ability to type freely into open-text boxes supported exploration of RQ1.6 by allowing students to express their perspectives on emotions in their own words. The adaptive structure of the questionnaire, incorporating filter logic to display relevant questions based on prior responses, ensured that students only engaged with questions pertinent to their experiences. This feature maintained engagement and produced rich, individualised data, particularly valuable in addressing RQ2.3 regarding factors that influence the design process.

Additionally, the online questionnaire's automated data collection, filtering, and storage processes reduced the risk of human error, enhanced data consistency, and facilitated the efficient management of large datasets (Bryman, 2012; Clark et al., 2021). From a design perspective, the format aligned with Yin's (2003) definition of research design as a logical plan connecting questions to conclusions through systematic data collection and analysis. The structured questionnaire format supported this logic by clearly linking research propositions, units of analysis, and targeted questions.

Finally, the questionnaire provided practical and logistical advantages, including cost-effectiveness, scalability, and the elimination of interviewer bias or variability. It allowed for consistent data collection across two culturally diverse student groups (Scotland and Jordan) and over two semesters, ensuring comparable findings. Despite known limitations such as inflexibility and potential response fatigue (Clark et al., 2021), the tool's overall benefits, including clarity, reliability, scalability, and efficiency, make it an ideal method to complement the cultural probe and deepen understanding of how emotions influence novice designers' engagement and decision-making processes.

### *3.2.3 Semi-Structured Interview as an In-Depth Emotional Tool*

The use of semi-structured interviews in this research is justified by the need to explore the complexity and subjectivity of design students' emotional experiences dimension that could not be fully captured through the questionnaire alone. While the questionnaire provided a broad, structured understanding of emotional patterns, its fixed format limited opportunities for follow-up, clarification, and exploration of emerging themes (Bryman, 2012; Clark et al., 2021). Given that this study investigates emotions as dynamic, context-dependent, and deeply personal phenomena, a more flexible and interpretive approach was essential. Semi-structured interviews offered this depth by enabling direct interaction between the researcher and participants, allowing for clarification, probing, and spontaneous exploration of new ideas that surfaced during discussion.

This method provided the flexibility to adapt the wording, sequence, and focus of questions according to each participant's responses, ensuring a more authentic and nuanced understanding of their emotional engagement with the design process (Arksey & Knight, 1999). It also allowed the researcher to identify subtle emotional cues, contextual influences, and reflective insights that structured methods often overlook. Conducting the interviews with students from two different cultural and educational contexts (Scotland and Jordan) further enriched the data, revealing cross-cultural variations in emotional experiences and coping strategies.

In addition, the semi-structured format aligned with the exploratory and interpretive nature of this research, ensuring that the methodological approach remained responsive to new findings and evolving insights. The conversational nature of the interviews encouraged participants to articulate their emotions in their own words, creating space for unexpected discoveries and deeper reflection. By combining structure with flexibility, this method bridged the gap between quantitative breadth and qualitative depth, allowing for a more comprehensive understanding of how emotions, particularly complex or ambivalent ones, influence design students' decision-making and engagement throughout their creative process.

### *3.2.4 Workshops and Focus Groups as Collaborative Verification Tool*

The use of workshops and focus group interviews in this research is justified as a critical methodological strategy to validate and enrich the findings derived from the earlier exploratory phase. According to Guba and Lincoln's (1994) framework of trustworthiness, qualitative research must address four key criteria, including credibility, transferability, dependability, and confirmability, to ensure the integrity and robustness of its conclusions. Incorporating workshops and focus groups allowed the study to meet these criteria by engaging participants and design experts in collectively assessing, challenging, and interpreting the findings. Through this process, the study established credibility by confirming

that the interpretations authentically represented participants' experiences, ensured transferability by examining their relevance within design education contexts, and strengthened dependability by revealing whether the results could be consistently understood and replicated over time. Furthermore, engaging tutors and experts in evaluating the research outcomes contributed to face validity (Bryman, 2012), ensuring that the constructs and questions reflected the lived emotional experiences of design students intuitively and meaningfully. groups were particularly valuable for creating a dynamic environment that encouraged open interaction, debate, and reflection among participants. Unlike individual interviews, focus groups emphasise shared meaning-making, allowing participants to respond to, build upon, and occasionally challenge one another's views (Słupińska, 2018). This collective dialogue not only surfaced diverse perspectives but also provided insight into how students construct, negotiate, and refine their emotional understanding in relation to design practice. Such group-based exchanges mirrored real-world educational dynamics, where students learn and form opinions collaboratively, thereby offering a more authentic picture of emotional engagement in design education.

Complementing this, workshops served as participatory and generative spaces that extended the verification process through deeper engagement and co-learning. As Ørngreen and Levinsen (2017) and Ahmed and Asraf (2018) note, workshops represent a valuable qualitative research approach that promotes rich interaction, trust-building, and knowledge co-creation. They enable participants to collaboratively test, reflect upon, and refine ideas, contributing to both the credibility and depth of findings. Their extended and interactive nature fosters a trusting relationship between facilitator and participants, encouraging openness and genuine dialogue. Moreover, workshops support purposive sampling of information-rich participants and enable persistent observation, allowing the facilitator to act as a research instrument who both observes and contributes to meaning-making. (Ahmad & Wilkins, 2025; Clark et al., 2021; Tajik et al., 2025)

Together, the use of focus groups and workshops strengthened the study's methodological rigour by embedding verification within the research process rather than treating it as a final step. This multimethod, dialogical approach not only confirmed the relevance and accuracy of earlier findings but also expanded understanding of the emotional dimensions shaping design students' experiences. By enabling participants to co-reflect, question, and reinterpret emerging insights, these methods advanced the research from exploration to confirmation, reinforcing its credibility, contextual sensitivity, and contribution to design education scholarship.

## Part One: Exploration Study Methodology

Due to the huge emotional spectrum in human language (Desmet, 2002), a manageable list of emotions that students could easily navigate was needed. Therefore, the exploration study was divided into two phases to structure the research approach: a divergent step during the first pilot case study and a convergent step in the second main study.

The goal of the first pilot study was to remain open and inclusive, allowing students to identify a broader range of emotions. To support this, a range of emotional models was explored in the literature, each presenting a distinct set of emotions. As part of this, various emotion-list approaches (see 2.3.3, pp.104) were reviewed alongside the foundational emotion sets proposed by key theorists such as Tomkins (1963, 1984), Ekman et al. (1972, 1973, 1992), Izard (1971, 1977), Plutchik (1980, 1982), and Darwin (1872) (see Table 2-1, 2.3.3.1, p.106). These models are considered relevant to the design process as they reflect emotions commonly experienced in everyday human life. Further, these emotions are grounded in cross-disciplinary emotion research, supported by evidence from psychological studies, considered universal, and have been shown to emerge consistently across different cultures and contexts (Ekman, 1973). However, as these models primarily emphasise basic emotion sets, there was a need to expand beyond these categories to offer students a broader range of emotional options. To achieve this, additional perspectives were incorporated, particularly those informed by research into individuals' emotional awareness and learning. As a result, several additional emotions were identified, leading to the development of a final list of 48 emotions used in the first study.

In the second convergent step, the focus was narrowed down to emotions specifically relevant to educational settings. Drawing from the academic emotions literature (see 2.4.2.1, pp.118), a refined subset of 13 emotions was selected for their relevance to the educational context and their meaningful overlap with the broader set used in the initial pilot study, which was incorporated into the second tool. This transition marked a shift from an open-ended exploratory phase to a more targeted investigation of emotions in the design education context.

## 3.3 Preliminary Study Method

### 3.3.1 The EmotionProbe: An Exploration of Design Students' Emotions when Designing

This section of the research presents the first step in exploring design students' emotions during the design process (Figure 3-4). This pilot study involved 29 students (14 from Scotland and 15 from Jordan), all of whom were in their 2nd and 3rd year of study. Conducted over a period of one month, the study was integrated into four face-to-face lectures within a design studio setting. A curated list of 48 emotions was used to help students articulate and reflect on their emotional experiences throughout the design process. This initial phase aimed to test the feasibility of emotion-tracking tools and lay the foundation for deeper exploration in subsequent stages of the research.

| Research Tool   | Students Participating  | Study Level   | Study Course   | Study Duration  | Number of Emotions  |
|---|---|---|--|---|---|
|  |  |  |  |  |  |
| <b>Cultural Probe</b><br>EmotionProbe   | <b>29</b><br>14 Scottish<br>15 Jordanian  | <b>2<sup>nd</sup>, 3<sup>rd</sup></b><br>year design<br>students                  | <b>Product,<br/>Packaging<br/>Design</b>   | <b>1 Month</b><br>4 lectures  | <b>48</b><br>emotions   |

Figure 3-4. Preliminary Study Details.

The EmotionProbe (Figure 3-5) is a custom designed cultural probe that captures design students' emotions while they design, which cannot be observed directly. The probe allows simple data collection, offering insights into emotions felt during the students' design process stages. The probe introduces the spectrum of emotions that design students experience and showcases various analysis approaches, allowing for a richer understanding of the students' emotions. This study provided answers to RQ1.1, RQ1.2, RQ1.3, RQ1.4, and RQ2.1 (see Figure 3-1, 3.1, p.131).



Figure 3-5. EmotionProbe Design Tool.

### 3.3.2 The Development of the EmotionProbe

The EmotionProbe is a paper-based self-reporting tool designed for students to complete during their design studio time, while actively engaged in the design process. The probe captures data on students' emotional experiences, the intensity of those emotions, and the specific stages of the design process in which they occur. The tool was intentionally developed as a reporting tool, grounded in the understanding that both emotions and the design process are deeply personal, internal, subjective, and inherently non-linear experiences (Schön, 1992b; Shouse, 2005). To ensure consistency and equal accessibility among participants, the probe was provided in printed form, avoiding the variability of digital formats and encouraging tangible engagement with the tool. The development is based on first constructing the EmotionProbe and second, managing the procedure of using the tool.

#### 3.3.2.1 The EmotionProbe Construction Elements

The EmotionProbe was developed to collect both qualitative and quantitative data related to the emotions of design students. It captures reflective insights into students' emotional experiences and measurable data on the intensity of those emotions.

The probe was presented as an A5-format booklet consisting of 60 pages across 31 minimal-design spreads, featuring large-font prompts, an intensity scale, and an emotion wheel (Figure 3-6). Undergraduate design students completed the booklet as part of a design task integrated into their regular curriculum. The EmotionProbe included four core components:

1. **The Sentence to Complete (SCT):** Based on the design process stages, structured sentences guiding reflection on specific stages of the design journey allow for open-ended qualitative responses.
2. **The Emotion Wheel:** Offering a broad range of emotion options to support self-identification.
3. **The Intensity scale:** Enabling students to rate the strength of their emotional responses and providing a quantitative responses.

Together, these elements offer both qualitative insights and quantitative measurements, enabling a deeper understanding of the student's emotions (see Appendix 1, 402).

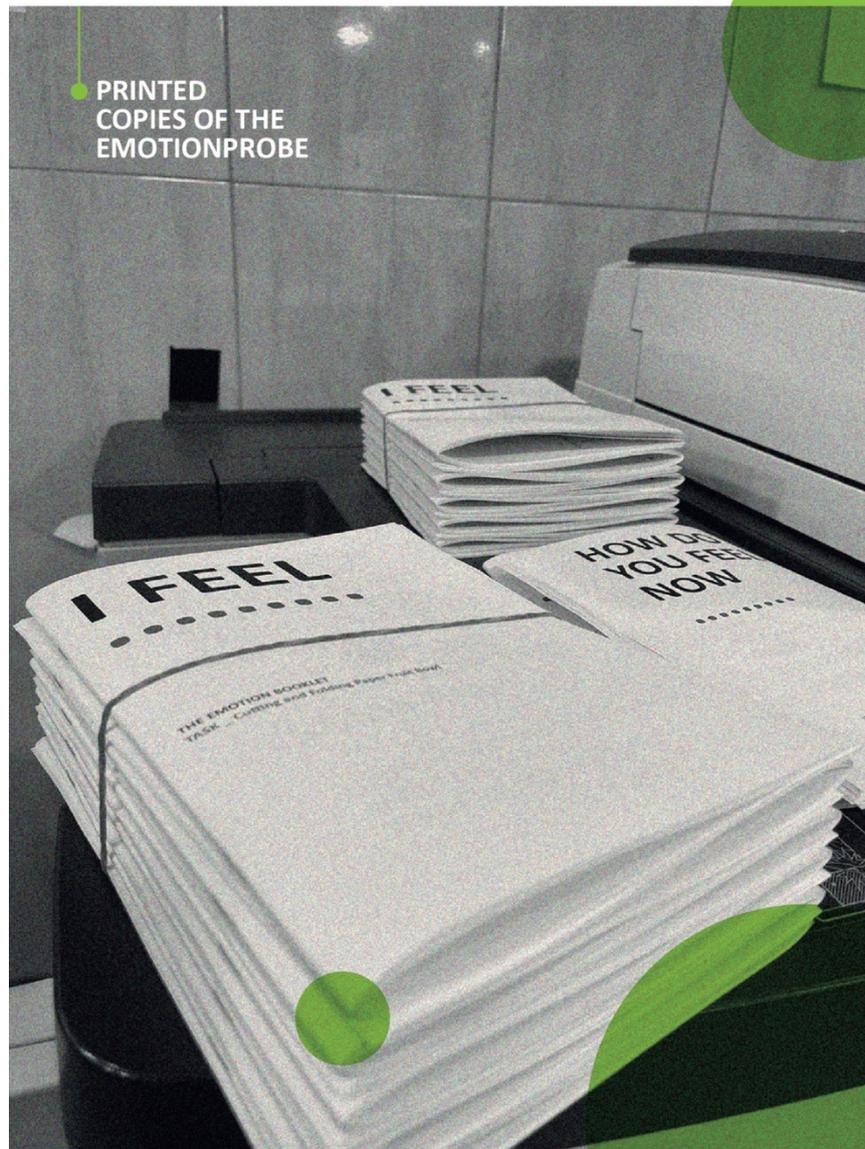


Figure 3-6. Printing and Preparation of the EmotionProbe.

## 1. The Sentence to Complete

This study employed the design process presented by Milton and Rodgers (2013), consisting of six process stages: research (opportunity identification), design brief and specification, concept design, design development, detail design, and production (See Figure 2-17, 2.2.6, p.83). The reason for using this design process framework was as follows:

- First, the framework allows iteration at each stage, and the detailed stage explanations clarify deeper exploration during each stage.
- Second, the framework incorporates seven design methods of looking, learning, asking, prototyping, testing, evaluating, and communicating, which can be utilised during the process with a thorough explanation of the different design tools that can be used to achieve the goal of the research (see Figure 2-18, 2.2.6, p.84).

As a result, sentences were developed in alignment with the sequence of the design process and tailored to reflect stage-specific aspects. Furthermore, the sentences were created using the Sentence Completion Test (SCT) method, which presents the qualitative aspect of understanding design students' emotions (Figure 3-7). Responses based on this method can provide insights into the emotional quality, intensity, passivity, and symbolism (Sacks & Levy, 1950). This method has been beneficial in investigating mental and intellectual abilities, as shown in Ebbinghaus's research on mental abilities in the 1970s (Holsopple & Miale, 1954). Watson (1978) reviewed the usage of this method during that period and highlighted two other studies that relied on this approach to study emotional responses and assess personality. Nowadays, the (SCT) method is employed in various fields to evaluate and enhance personal expression.

|   |   |  |   |
|---|---|--|---|
| <p>When the card fruit bowl task was first introduced, I felt.....</p> <p>← see your thinking</p> | <p>After the design brief was given, I felt.....</p> <p>← see your thinking</p>               | <p>Asking for more information makes me feel.....</p> <p>← see your thinking</p>                     | <p>After researching, I felt.....</p> <p>see your thinking →</p>                |
| <p>When I understand the task, I felt.....</p> <p>see your thinking →</p>                         | <p>Looking at existing examples makes me feel.....</p> <p>see your thinking →</p>             | <p>Creating numbers of different concepts makes me feel.....</p> <p>see your thinking →</p>          | <p>I felt..... about my initial design solution.</p> <p>see your thinking →</p> |
| <p>I felt..... after I saw my classmates' designs.</p> <p>see your thinking →</p>                 | <p>Going back to my idea after being away from it, I felt.....</p> <p>← see your thinking</p> | <p>After I tested my model, I felt.....</p> <p>← see your thinking</p>                               | <p>The trial and error phase, makes me feel.....</p> <p>← see your thinking</p> |
| <p>When applying the dimensions to my design, I feel.....</p> <p>see your thinking →</p>          | <p>When I tried to enhance my model, I felt.....</p> <p>see your thinking →</p>               | <p>Being precise and accurate with hand-made-model makes me feel.....</p> <p>see your thinking →</p> | <p>I feel..... hearing feedback about my design.</p> <p>see your thinking →</p> |

Figure 3-7. Sentences Used within the EmotionProbe.

Accordingly, twenty-seven sentences were created to be completed based on the design process framework. These sentences focused on the emotions associated with designing rather than the outcome of the given design project (Table 3-1). For the brief and specification stages, six sentence prompts were created; for the research and concept development stages, five; for design development and detailed design stages, four; and for the production stage, three. The decreasing number of questions across the stages reflects the shifting nature of the design process; early stages often involve higher levels of uncertainty, exploration, and emotional fluctuation, which benefit from more reflection prompts. As students progressed through the later stages of the design process, the prompts became fewer and more focused to sustain engagement and avoid overwhelming students with repetitive or excessive questions while still capturing meaningful data.

Table 3-1 SCT in Relation to the Design Process.

| Design Process Stages                        | Sentence to Complete (SCT)                                       |  |   |  |   |  |
|--|--|--|---|--|---|--|
| <b>Brief and Specification</b>               | When the card fruit bowl task was first introduced, I felt ..... | After the design brief was given, I felt ..... | Asking for more information makes me feel .....                     | I felt ..... when choosing the needed tools for the task | Planning my process to solve the design challenge makes me feel | The expected expectation from the task makes me feel ..... |
| <b>Research (Opportunity Identification)</b> | After researching, I felt .....                                  | When I understand the task, I felt .....       | Looking at existing examples makes me feel .....                    | When I started generating ideas, I felt .....            | When I had my first idea, I felt .....                          |  |
| <b>Concept Design</b>                        | Creating numbers of different concepts makes me feel .....       | I felt ..... about my initial design solution  | I felt ..... after I saw my classmates' designs                     | I felt ..... when I created my demo paper prototype      | I feel ..... sharing my idea with my classmates                 |  |
| <b>Design Development</b>                    | Going back to my idea after being away from it, I felt .....     | After I tested my model, I felt .....          | The trial and error phase, makes me feel .....                      | Using less tape makes me feel .....                      |   |  |
| <b>Detail Design</b>                         | When applying the dimensions to my design, I feel .....          | When I tried to enhance my model, I felt.....  | Being precise and accurate with hand-made-model makes me feel ..... | After I completed my card model, I felt .....            |   |  |
| <b>Production</b>                            | I feel ..... working with others to produce my model.            | I feel ..... after submitting my task          | I feel ..... hearing feedback about my design                       |  |   |  |

## 2. The Selection of the Emotion and the Study Wheel Creation

To support students with a manageable and accessible list of emotions, the probe adopted the emotion wheel perspective, which is widely recognised as an effective tool in psychological research for exploring emotional experiences (Plutchik, 1982). Emotions were drawn from Plutchik's (1982) Wheel of Emotions and Willcox's (1982) Feeling Wheel, both of which informed the structure and design of the EmotionProbe wheel. These two wheels were used for several reasons. First, both wheels cover a broad range of basic emotions that are fundamental to human experiences and widely recognised across cultures. Second, Plutchik's model offers a three-dimensional structure that organises emotions along basic-to-complex categories and includes the concept of emotional dyads, making it particularly useful for capturing layered emotional responses (Plutchik, 1991; Plutchik, 2001). Third, Willcox's Feeling Wheel, which was developed based on Plutchik's model, provides additional emotional variation, helping individuals to identify, express, and reflect on subtle shifts in their emotions (Willcox, 1982). Finally, by offering students a structured set of options to choose from, the tool reduces the stress of recalling specific emotion names, making the self-reporting process more user-friendly and effective. Hence, Plutchik's wheel consists of 32 emotions, while Willcox's wheel consists of 78 emotions (Figure 3-8).



Figure 3-8. Emotions Wheels Embedded in this Study (Left: Plutchik's Wheel of Emotions (Plutchik, 1982), Right: Willcox's Feeling Wheel (Willcox, 1982)).

The relationship between these two frameworks lies in their complementary nature. Plutchik's Wheel provides a foundational understanding of basic emotions and their relationships, while Willcox's Feeling Wheel offers a more comprehensive and detailed exploration of those emotions. By combining the two, individuals can gain a deeper understanding of their emotional experiences, recognising both the primary emotions at play and the subtler variations within them. However, due to the huge number of emotions

presented in these wheels, the final wheel used in the EmotionProbe involved adapting and selectively extracting certain emotions that are appropriate to the study's purposes and focused area. An informal evaluation session with a design tutor and professional was conducted to help the researcher determine the suitable and relevant use of these emotions. Therefore, the decision was made based on the appropriateness of the chosen emotion to the study context and to allow students to complete the tool efficiently while also reducing the complexity of distinguishing between emotional differences within the same basic category. Simplifying the emotion options helped minimise confusion, supported easier recognition of felt emotions, and ultimately saved time during the self-reporting process. The emotions extracted from these wheels for the study purpose were in total 48 emotions as follows (Figure 3-9): eight basic emotions: Joy, Trust, Anticipation, Surprise, Sadness, Disgust, Anger, and Fear, and 40 secondary emotions: Energetic, Fascinating, Playful, Delightful, Ecstasy, Worthwhile, Satisfied, Hopeful, Acceptance, Admiration, Insecure, Excited, Anxious, Thoughtful, Relaxed, Amazed, Distracted, Disappointed, Confused, Content, Guilty, Ashamed, Depressed, Bored, Sleepy, Miserable, Inferior, Rejected, Foolish, Embarrassed, Sceptical, Irritated, Frustrated, Mad, Annoyance, Submissive, Apprehension, Weak, Scared, and Terror.

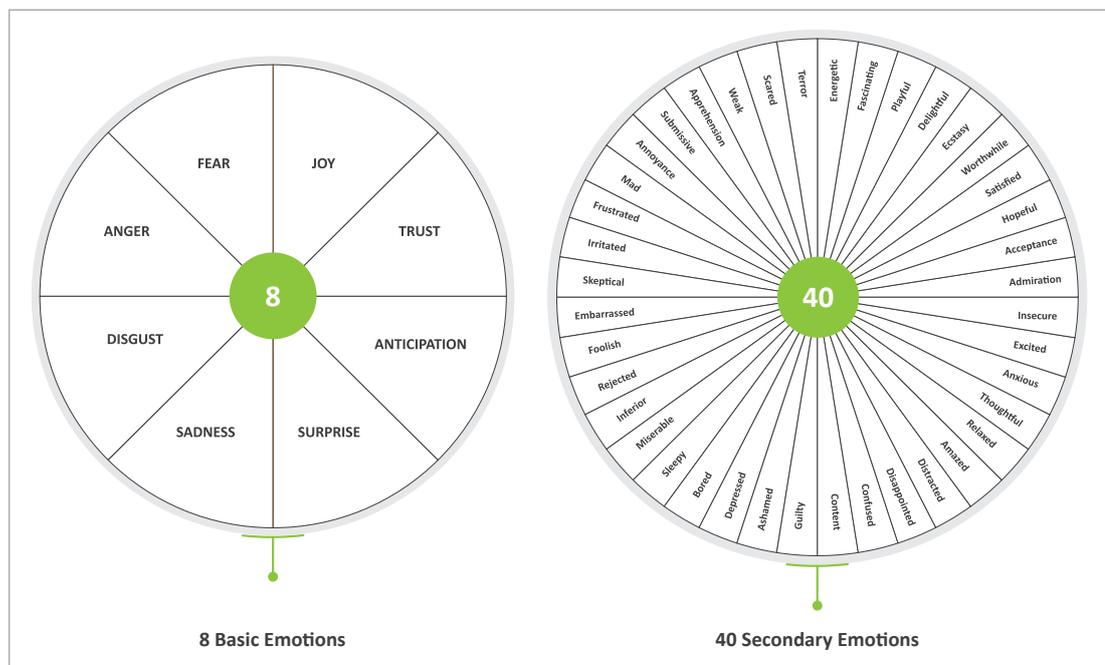


Figure 3-9. Adapted List of Emotions in this Study.

The final selection of emotions included in the wheel (Figure 3-10) for the study was guided by several key criteria. First, the process began with identifying core emotions that are fundamental to human experience and widely recognised across cultures. These core emotions formed the foundational basis for the research. Second, emphasis was placed on selecting emotions that meaningfully represent the design process as both an ongoing activity and an achievement-oriented endeavour. The aim was to include emotions that could capture key dimensions of emotional experiences. In addition, priority was given to emotions considered particularly relevant or influential within an educational context. The selection

also sought to balance breadth and depth by offering a diverse range of emotions while ensuring each selected emotion could support later analysis from a dimensional emotion perspective. Hence, emotions expected to provide unique insights into the design process and contribute to a comprehensive understanding of students' experiences, therefore, practical considerations were central to the selection process. These included the feasibility of measuring and analysing the chosen emotions within the time and methodological constraints of the study. A manageable number of emotions was deliberately chosen to ensure the data collection remained focused and rigorous.

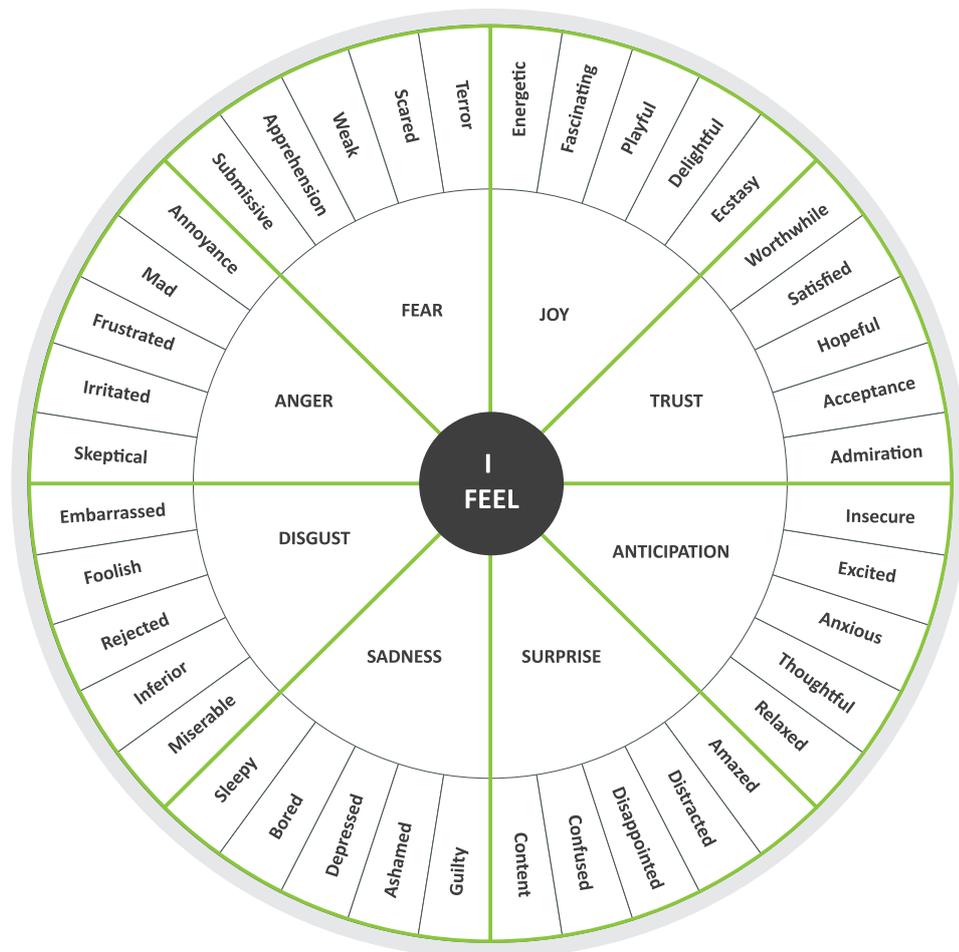


Figure 3-10. Final Emotion Wheel Used in the EmotionProbe.

As mentioned, to reduce researcher bias and validate the selection, feedback was sought from peers, including design tutors, colleagues, and design graduates. Their input helped assess the appropriateness, clarity, and comprehensiveness of the emotion list, leading to final refinements before the emotions were integrated into the research tool. Hence, the emotions and the wheel's structure can be adapted to suit the specific purpose of a study and can be adjusted in various ways depending on the researcher's aims and objectives.

### 3. The Intensity Scale

According to Taherdoost (2019), the selection of a response scale is influenced by the research goals, the nature of the questions, and the characteristics of the population under study. This study employed a Likert scale to measure intensity, with students rating their experiences on a numerical scale of 1 to 5. A rating of 1 indicates very low intensity, while a rating of 5 denotes very high intensity. Despite the focus of this study on the emotional spectrum, the scale plays an important role in identifying the most intense phases of the design student's journey. The original five-point scale was utilised to promote faster and easier data collection, thereby ensuring symmetry and balance in the scale (Figure 3-11).

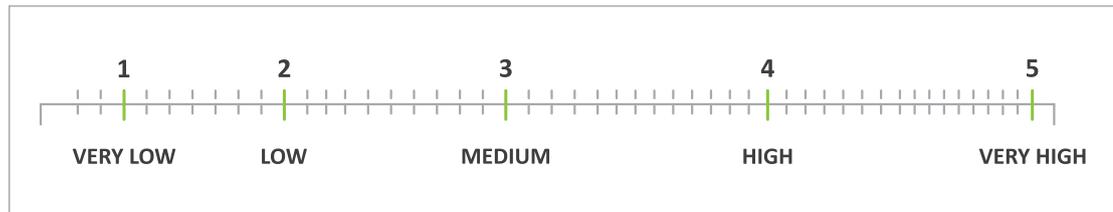


Figure 3-11. Study Likert Scale.

The Likert scale ranges from one to five, with varying visual spacing between the intensity numbers to help students understand the gradual increase in emotional intensity. Students were instructed to select one of the numbers on the scale.

#### 3.3.2.2 The EmotionProbe Procedure

The EmotionProbe was designed to be used by students, and therefore, it was a priority for the researchers to ensure consistency across key elements of the study. First, the participating students were all at the same level of design education, ensuring a comparable baseline of experience and skill. Second, the design task assigned to students was standardised, with all participants working on the same project. Third, a course that aligned across both countries was selected, focusing on a product design-related class to ensure thematic consistency. This alignment ensured that students from different cultural and educational backgrounds were engaged with a similar design genre. Importantly, all students completed the same design task, which helped to minimise discrepancies in emotional responses that could arise from variations in project type or complexity.

#### 1. Participants

As this is the first exploratory study of this research, the study started with students who are still at the beginning of their design learning journey. Accordingly, the study includes 29 undergraduate design students (Figure 3-12) with a minimum of one year of experience in design from two universities, the German Jordanian University at the Department of Design and Visual Communication - Jordan and the University of Strathclyde at the Department of Design, Manufacturing, and Management Engineering - Scotland studying design. 14 from Scotland were aged between 18-21. Among them, 7 were identified as female, and 7 were

identified as male. 15 from Jordan were aged between 19-23. Among them, 8 were identified as female, and 7 were identified as male.



Figure 3-12. Design Students Working on their Design Task and Filling the EmotionProbe.

## 2. Design Task

The students were assigned a design task, and a multidisciplinary team of four academics helped implement the EmotionProbe throughout the task duration. The design project was developed as part of the product design class.

Students were provided with a design brief at the beginning of the class. This project was integrated as part of the course syllabus, and the instructors were responsible for assisting and giving feedback to students in case needed and evaluating and assessing the final outcomes. The researchers had the opportunity to attend two sessions (face-to-face in Scotland and online in Jordan) during the data collection process, enabling a comprehensive observation of the students' reactions and the probe's usability (Figure 3-13).

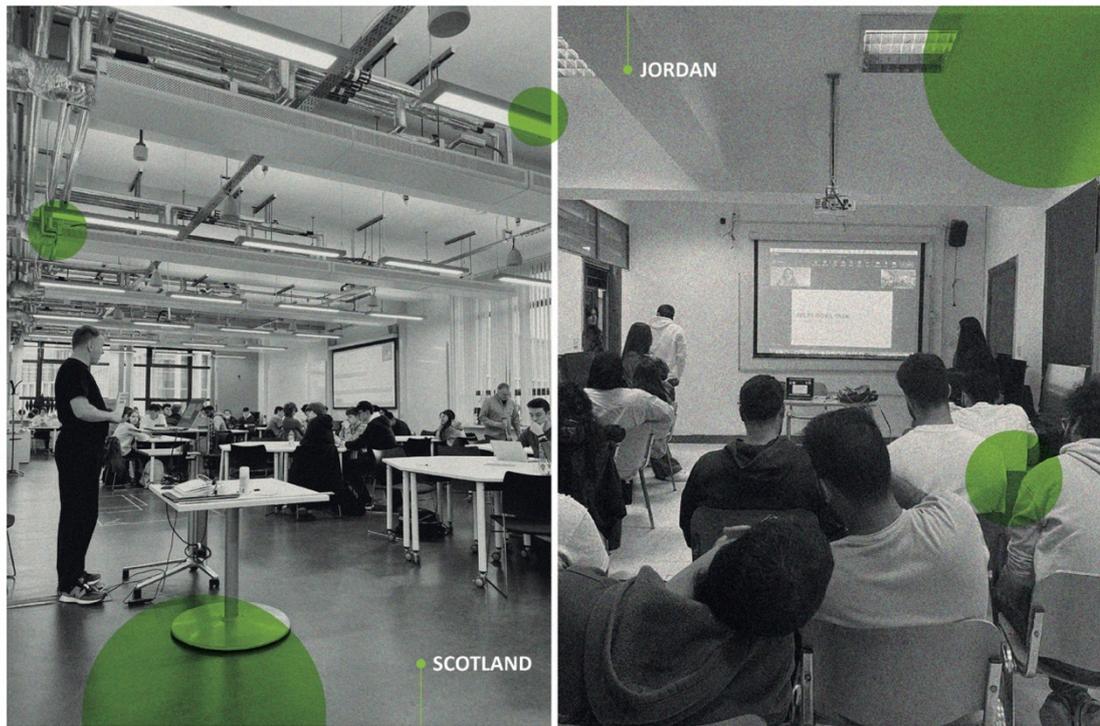


Figure 3-13. Instructions are given to students in Jordan and Scotland.

The brief was set for a task embedded within the larger project; this brief was not a main project itself, but was designed to help students understand the structure and materials that would support their work on the primary project. The design brief for the task was as follows:

***Fruit Bowl:*** Students are required to design a fruit bowl using cutting and folding techniques only. They need to produce different bowl prototypes made from paper, then they have to choose one design concept and submit their final bowl made out of white card. Using tape is not allowed, and using coloured paper isn't allowed.

The students were asked to take pictures of the process and of the different prototypes. They also needed to take pictures of the final fruit bowl made from the cardboard and submit them to the lead tutor. This design task given (Figure 3-14) underscored students' idea generation, emphasising thorough research on the topic, utilisation of available tools and materials, application of specific techniques, and limitations in the design and production processes. Students worked during design studios and at home to achieve and submit the results.

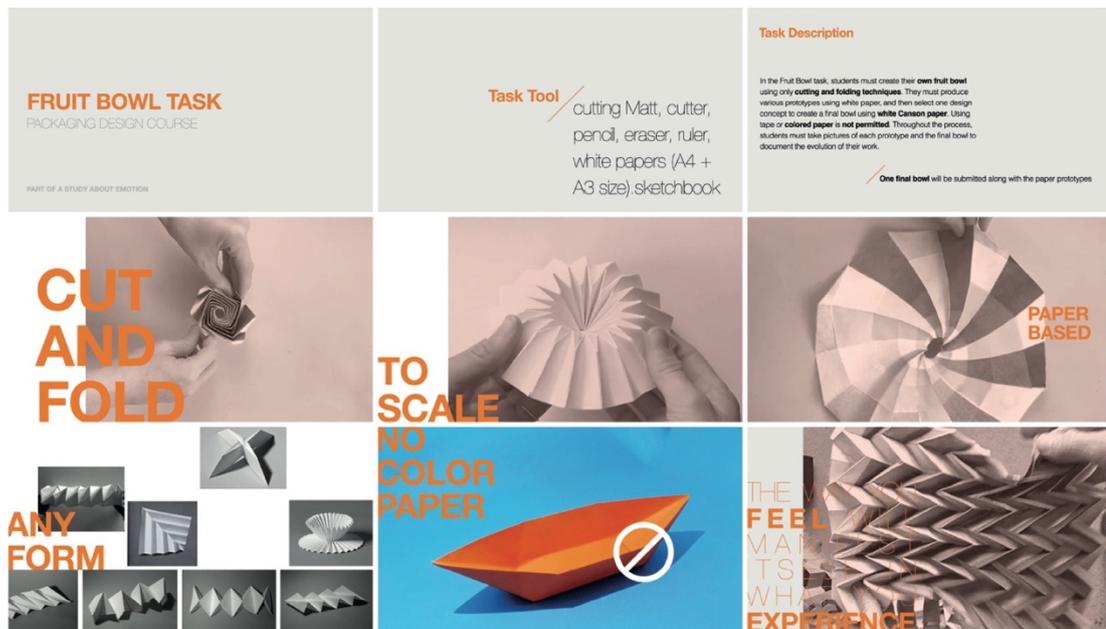


Figure 3-14. Slides Presented during the First Lecture to present the Design Task.

The study was structured around a four-session design task, aligned with key stages of the design process and supported by integrated data collection through the EmotionProbe tool. The design brief focused on a product design challenge, specifically, the creation of a fruit bowl, and was embedded within the students' regular coursework. In Session one, students were introduced to the project brief and began the initial stages of research, concept generation, and sketching. This session served to initiate the design process and orient students toward the task. Session two focused on developing the design concept and design details, where students began prototyping and refining their ideas. During this session, students completed the first EmotionProbe reporting round, documenting their emotional experiences during the early phases of their design process. In Session three, students moved into design development, where they refined and progressed their concepts. Feedback was offered where necessary, although no EmotionProbe data was collected in this session. Finally, Session four involved the production phase, in which students submitted the final version of their fruit bowl design. They also completed the second EmotionProbe reporting round, capturing emotional responses linked to the completion and delivery of their design outcome.

This structure enabled the collection of emotional data at two key points: mid-process and post-completion, providing insights into how students' emotions evolved throughout the design journey.

The EmotionProbe was distributed to students to collect data in two separate rounds in both countries (Table 3-2). Hence, this task was aligned with the two department courses under a product design theme, and the probe was distributed based on two sessions during the design process.

Table 3-2. Sessions, Processes, and Activities (Marji et al., 2024b).

| Sessions      | Design Process stages                          | Activities  |
|---------------|--|---|
| Session One   | Design project brief introduction and research | Introducing the task to students, the students start researching and drawing concept and sketching. |
| Session Two   | Design concept and design details              | Students working on prototype, feedback, filling the EmotionProbe - first round reporting           |
| Session Three | Design development                             | Developing the final concept, feedback in case needed   |
| Session Four  | Production                                     | Submitting the final design of the fruit bowl, filling the EmotionProbe - second round reporting    |

### 3. Instructions for using the EmotionProbe

After the design task was introduced to the students, a brief overview of the research was presented, followed by a demonstration of how to use the EmotionProbe. During the class, the researcher distributed the booklet to students who were willing to participate, as participation was entirely voluntary, and no one was obligated to take part. Students worked individually on the design challenge, with all necessary materials such as paper, cutters, rulers, and other tools provided by the class instructors.

In the first data collection session, which took place near the end of the class, students were asked to begin filling out the booklet. They were instructed to go through the pages, read each sentence prompt, and select one emotion that best reflected their emotional experiences in relation to each statement. This process continued until all the sentence prompts in the booklet were completed. The instructions were kept simple, and any questions raised by students were addressed by the researcher. The second round of data collection took place during session three (see Table 3-2, 3.3.2.2, p.153), following the same procedure and using the same EmotionProbe booklet and prompts. In total, 58 booklets were collected across both sessions, 29 from each of the two student groups participating in the study.

### 3.4 Main Study Methods

This section of the research presents the second and main step in collecting the data to explore design students' emotions during the design process. This study occurred in Jordan and Scotland during the 2023/2024 academic year. Participation was entirely voluntary, with no obligation for students to take part. Design students enrolled in the design department participated in the mixed data collection methods, including three tools (Figure 3-15), used as follows:

- **The Emotion Tracker** is a culture probe tool designed for this research purposes.
- **The Feedback Sheet** is a questionnaire that examines the tracking experiences and factors of the design process in greater depth.
- **Semi-structured Interviews** are employed to provide further clarification after the tracking study is completed.

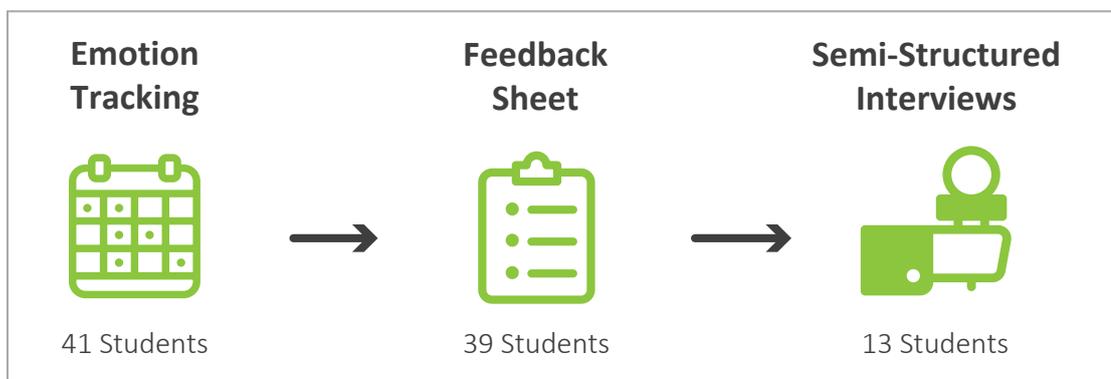


Figure 3-15. Main Study Method Tools.

This section investigates design students' emotional experiences by extending the timeline and incorporating students' major design projects. This approach broadens the exploration of emotions within the design process. This study aims to contribute answers to RQ1.2, RQ1.3 RQ1.4, RQ1.5, RQ1.6, RQ2.1, RQ2.2, RQ2.3, R3.1, RQ3.2 (see Figure 3-1, 3.1, p.131).

## Tool One

### 3.4.1 Emotion Tracker: Examining the Emotional Journey of Final-Year Design Students

This study involved 41 students (27 from Scotland and 14 from Jordan) in their fifth year of design study. The study was conducted over two semesters over one academic year calendar, during which students tracked their emotions once a week. A curated list of 13 emotions was used to help students articulate and reflect on their emotional experiences throughout the design process (Figure 3-16).

| Research Tool   | Students Participating  | Study Level   | Study Course   | Study Duration  | Number of Emotions  |
|---|---|---|--|---|---|
|  |  |  |  |  |  |
| <b>Cultural Probe</b><br>Emotion Tracker  | <b>41</b><br>27 Scottish<br>14 Jordanian  | <b>5<sup>th</sup></b><br>year design<br>students                                  | <b>Final Design Project</b>  | <b>1 Year</b><br>tracking<br>once a week  | <b>13</b><br>emotions   |

Figure 3-16. Emotion Tracking Tool Details.

The Emotion Tracker is the second cultural probe custom-designed tool that capture design students' emotions during their design projects. The tracker is designed in a single-page format with a simple layout for quick navigation. It consists of three questions: the first defines the design process stage by shading boxes for each week; the second uses a five-point scale to track five emotions linked to design activities; and the third presents eight predefined emotions, requiring students to select one emotion to answer seven questions exploring achievement-related emotions (Figure 3-17). Hence, emotion exploration tools can benefit from two formats for reporting verbal emotion: the free format or the fixed format (Scherer, 2005). Given the purpose of this research, the fixed format was chosen. The fixed format has both advantages and disadvantages. On the one hand, it saves time and effort. On the other hand, it may result in losing valuable insights or overlooking other prominent emotions that could emerge during the process, limiting participants' ability to express themselves fully and potentially leading to a loss of interest (Desmet, 2018; Schouteten et al., 2021). To address this limitation, the tracker was modified in the second part of the study by adding 'other' to the emotion options to overcome rigidity and allow deeper exploration.

The tracker focuses on the academic emotions spectrum that designs students' experiences. As a result, it showcases various analysis approaches, allowing for a richer understanding of the students' emotions.

**Q1. In which stage you are working now based on your project semester timeline?**  
(Please shade the box, you can leave the box empty if you don't do anything during the week (Holiday, week off, etc))

| Design Process Stages        | W1 | W2 | W3 | W4 | W5 | W6 | W7 | W8 | W9 | W10 | W11 | W12 | W13 | W14 | W15 | W16 | W17 |
|------------------------------|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| Design Brief & Specification |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Research                     |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Concept Design               |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Design Development           |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Detail Design (Testing)      |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Production                   |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |

**Q2. Mark the level of each emotion towards the design stages that happened each week.**  
(Scale: 1= very low, 2= low, 3= medium, 4= high, 5= very high)

| Emotion        | W1 | W2 | W3 | W4 | W5 | W6 | W7 | W8 | W9 | W10 | W11 | W12 | W13 | W14 | W15 | W16 | W17 |
|----------------|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| Enjoyment      |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Refutation     |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Anger          |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Frustration    |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Excitement     |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Relief         |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Disappointment |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |

**Q3. Choose one emotion (Joy, Hope, Contentment, Relief, Anxiety, Shame, Sadness, Disappointment, Other (mention)) to respond to the following statements for each week.**

|   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| How do you feel about your design project progress.   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| How do you feel about your project workload at this stage.  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| How do you feel about the skills you gained previously in developing your current project.                  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| How do you feel about your project contribution in enhancing your knowledge and skills for future projects. |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| How do you feel about the chance you have to explore ideas and concepts in depth.                           |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| How do you feel about your achieved learning outcomes in this week.   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| How do you feel about the feedback you have received at this stage of your project.                         |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

THANK YOU!  
 Saranya Srinivasan, Pritz

Student Name: \_\_\_\_\_

Figure 3-17. Emotion Tracker (Main Study Tool).

### 3.4.2 The Development of the Emotion Tracker

The Emotion Tracker is a paper-based self-reporting tool designed to be completed by students weekly based on their preferred day while working and progressing with their design project. The tracker captures students' emotions regarding their activity and achievement, the intensity of the activity, and the frequency of achievement emotions. Accordingly, students reported emotions in relation to the specific stages of the design process in which they personally experienced them. To ensure consistency and equal accessibility among participants, the tracker was provided in printed form. However, students also had the option to complete it digitally, allowing them to engage with the tool in their preferred format. This section is constructed to include the Emotion Tracker development steps, and the explanation of using it.

#### 3.4.2.1 The Emotion Tracker Rational

The interest in researching emotions in education has grown substantially in recent years (Pekrun et al., 2007) due to the personal nature of students' educational journey, they encounter working on their projects (Schutz & Pekrun, 2007). Therefore, the study of academic emotions serves as a tool that can enhance flexible problem-solving and self-regulation while students experienced them during design studio instruction and academic performances (see 2.4.2.1, pp.118).

Given that, the tracker focuses on achievement emotions to build better understanding of the emotional experiences tied to students' achievement activities and outcomes. Achievement emotions specifically linked to students' sense control (Pekrun & Stephens, 2012). Pekrun et al. (2007) the Three-Dimensional Taxonomy of Achievement Emotions framework (see Table 2-3, 2.4.2.1, p.119) explains that this control of emotions arise from student's subjective control over their learning and student's subjective value assign to their academic tasks and outcomes (Pekrun, 2006). By identifying 16 key emotions Pekrun arranged them based on three core dimensions as follows:

- **Valence Dimension:** Represents the emotional spectrum from positive, pleasant emotions to negative, unpleasant emotions.
- **Arousal Dimension:** Reflects the intensity of emotions (strength), ranging from activation (high) to deactivation (low).
- **Object Focus Dimension:** This dimension encompasses, first, activity emotions experienced during active engagement in tasks such as studying, researching, or making, and second, outcome emotions triggered by the results of one's efforts, such as progress, setbacks, successes, and failures.

Integrating the Object Focus as a third dimension alongside the traditionally recognised dimensions of valence (positive versus negative) and activation (activating versus deactivating) (Watson et al., 1999) made this framework more appropriate to answer the study questions and achieve the aims. This third dimension illustrates a more in-depth relationship and differentiation between activity emotions experienced during learning actions and outcome emotions related to academic value and achievements (Pekrun et al., 2011). Given this, the tracker employs this framework to explore the emotional experiences of final-year design students throughout their year-long major design project.

#### *3.4.2.2 Scaling*

The goal was to develop a practical and user-friendly tool for capturing students' emotional experiences during design projects, it was important to choose methods that are simple to use and capable of offering insight into emotional and intangible experiences in the same time. Two important factors were considered when selecting the emotion capture format: scaling and clarity of emotional expression. A fixed emotion list combined with a basic 5-point Likert scale (ranging from 1 = very low to 5 = very high intensity) was chosen to ensure accessibility, easy use, and minimise the effort required from students while still enabling meaningful data collection.

The selection of a five-point Likert scale was further supported by guidance from Taherdoost (2019), who highlights that the choice of response scale should reflect the study's goals, the type of data being collected, and the characteristics of the target population. In this case, the five-point scale was appropriate to promote faster and easier data collection, provide balanced response options, and offer sufficient sensitivity to capture varying emotional intensities without overwhelming participants (Schouteten et al., 2021). Despite the emotional complexity of the subject matter, this scale allows for the identification of the most emotionally intense phases in the students' design journey.

Building on this and considering the importance of visual clarity of the weekly tracking process, the method was designed to fit onto a single-page layout, where students could easily engage with the tool throughout the duration of their project. This response format not only makes the reporting process faster but also provides quantity and quality essential insight into of emotions experienced at different stages of the design process. Importantly, this scaling method was also used in the preliminary study, and retaining it in the current phase ensures methodological consistency. Maintaining a consistent research approach is critical to achieving coherent results and allows for more reliable comparisons across different study phases.

#### *3.4.2.3 Emotion Selection for the Tracker*

Within Pekrun's theoretical framework, emotions are categorised into activity-related and outcome-related emotions based on their object focus and the way they are cognitively appraised within educational settings (Pekrun, 2006; Pekrun et al., 2007). Activity

emotions are typically linked to ongoing tasks and the learning process itself, while outcome emotions are associated with anticipated or actual results of academic performance. This distinction is not only conceptually grounded but also empirically supported through the Achievement Emotions Questionnaire (AEQ), which identifies the most frequently experienced emotions among university students. Furthermore, these emotions can be classified using the two-dimensional circumplex model of affect, which maps emotions according to their valence (positive or negative) and arousal (high or low) levels (Pekrun et al., 2011).

The selection of emotions for this tool was therefore informed by both robust theoretical grounding and continuity with previous research. 13 emotions were included to capture a range of affective experiences relevant to the design process. These include five activity related-emotions (Enjoyment, Relaxation, Anger, Frustration, and Boredom) which reflect emotions that arise during the act of designing, making, and doing. Additionally, eight outcome-related emotions were selected (Joy, Hope, Contentment, Relief, Anxiety, Shame, Sadness, and Disappointment) which capture students' reflections on their progress, performance, and perceived success or failure in their design projects (Table 3-3).

*Table 3-3. Adapted list of emotions for the Emotion Tracker.*

| Arousal      | Valence  | Object Focus            |                            |
|--------------|----------|-------------------------|----------------------------|
|              |          | Design Process Activity | Design Process Achievement |
| Activation   | Positive | Enjoyment               | Joy, Hope                  |
|              | Negative | Anger, Frustration      | Anxiety, Shame             |
| Deactivation | Positive | Relaxation              | Contentment, Relief        |
|              | Negative | Boredom                 | Sadness, Disappointment    |

Importantly, this emotion framework was also employed in our previous research (Marji et al., 2024b) to analyse emotional data, offering a consistent methodological approach. Maintaining this framework not only enhances comparability across studies but also supports a deeper exploration of emotional dynamics within the context of design education. Table 3-4 provides a summary of the rationale behind the selection and categorisation of these emotions, supported by peers' evaluations of the appropriateness of the selected emotions.

Table 3-4. Reasons for the Emotion Tracker Emotion Selection (Pekrun, 2006; Pekrun et al., 2007).

| Object Focus      | Based on                                       | Emotions Included   | Reason for Selection   |
|-------------------|--|---|--|
| Activity Emotions | Experiences during task                        | Enjoyment, Relaxation, Anger, Frustration, Boredom                      | Reflect emotional engagement with the process of learning.                             |
| Outcome Emotions  | Experiences regarding achievements and results | Joy, Hope, Contentment, Relief, Anxiety, Shame, Sadness, Disappointment | Reflect emotional reactions to success/failure outcomes, either anticipated or actual. |

#### 3.4.2.4 The Emotion Tracker Structure

The Emotion Tracker is a custom-designed research probe tool developed to collect qualitative and quantitative data related to the emotions of design students. It was presented in a 31x22 cm portrait format and featured three main questions (Figure 3-18 and Figure 3-19). 41 undergraduate design students completed the tracker as part of their major design project, integrated into their regular design course curriculum.

The tracker's three questions align along column headers representing the weeks from W1 to W17. Due to variations in university calendars between students and to account for holidays or special occasions that may occur throughout the year, additional weeks were included. Notably, each semester in Scotland consists of 10 weeks, whereas the Jordanian academic calendar spans 15 weeks per semester. Hence, 'other (mention)' options were added for students to express and rate additional emotions during the second semester enhanced version.

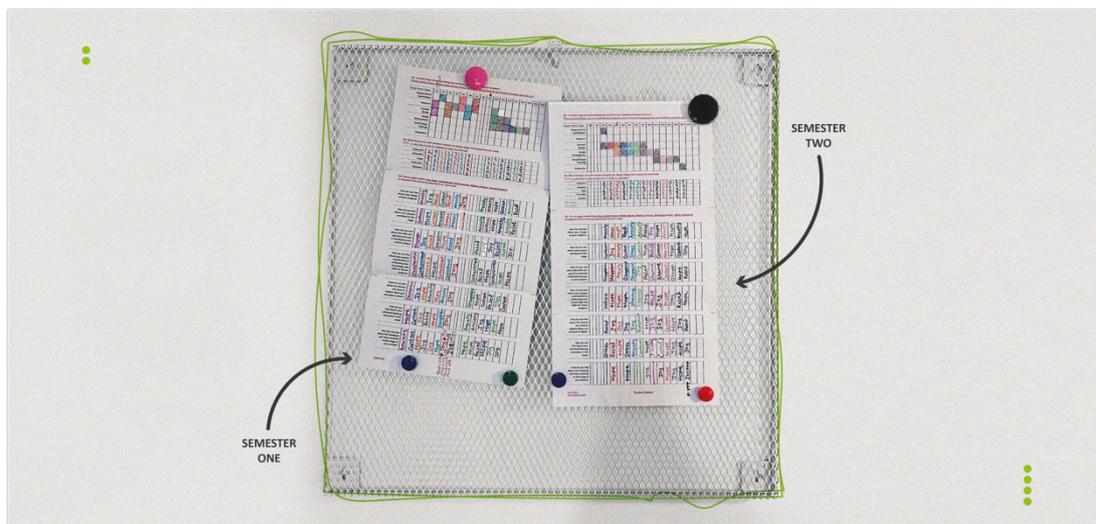


Figure 3-18. Emotion Tracker Filled by Student No.12 (Semester One and Two).



Figure 3-19. Emotion Tracker Filled by Student No.7 (Semester One).

**1. Question One: In which stage are you working on now, based on your project semester timeline?**

This question forms the first section of the tracker, aimed at identifying which stage of the design process the student is currently engaged in. This section incorporates six key stages of the design process, which are outlined as follows:

1. Design Brief and Specification
2. Research
3. Concept Design
4. Design Development
5. Detail Design
6. Production

Six-row labels represent the six stages adopted from Milton and Rodgers (2013). Based on the week, students are asked to shade the box corresponding to the design stage they are working on. If no work is done, the box in the specific week is left blank (Figure 3-20).

**Question One**  
*Design Process Stage Identifying*

**Q1. In which stage are you working on now based on your project semester timeline?**  
*(Please shade the box; you can leave the box empty if you don't do anything during the week (Holiday, week-off, etc.)*

| Design Process Stages        | W1 | W2 | W3 | W4 | W5 | W6 | W7 | W8 | W9 | W10 | W11 | W12 | W13 | W14 | W15 | W16 | W17 |
|------------------------------|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| Design Brief & Specification |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Research                     |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Concept Design               |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Design Development           |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Detail Design (Testing)      |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Production                   |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |

Figure 3-20. Emotion Tracker Question One.

**2. Question Two: Mark the level of each emotion towards the design stages that happened each week.**

This question constitutes the second section of the tracker and focuses on identifying the emotions experienced during the design process (Figure 3-21). Specifically, it captures activity-related emotions, including enjoyment, relaxation, anger, boredom, and frustration. These emotions are selected to reflect the affective experiences that students may encounter while engaging in various stages of the design process.





1. *How do you feel about your design project progress?*
2. *How do you feel about your project workload at this stage?*
3. *How do you feel about the skills you gained in developing your current project?*
4. *How do you feel about your project's contribution to enhancing your knowledge and skills for future projects?*
5. *How do you feel about the chance you have to explore ideas and concepts in depth?*
6. *How do you feel about your achieved learning outcomes this week?*
7. *How do you feel about the feedback you received at this stage of your project?*

For each question, students are instructed to choose the one emotion that best represents their feelings that week. These responses are intended to capture students' achievement emotions, which reflect their emotional responses to learning-related outcomes and expectations. In this context, these emotions are closely linked to the concept of subjective value that illustrate the importance students assign to their academic tasks and outcomes. This includes how meaningful they find their learning experiences, how relevant they perceive their skills development to be, and how much value they place on feedback and progress in the project.

#### **3.4.2.5 The Emotion Tracker Procedure**

The Emotion Tracker was designed to be used by design students throughout their final year design project. Therefore, it was important to maintain student engagement and ensure the process remained simple and accessible. In this study, all participating students were at the same stage in their design education, providing a consistent baseline of experience and skill. To align with the research aims, a course common to both countries was selected. This course focused on a final design project, allowing students to retain full ownership of their work. This alignment ensured that students from different cultural and educational contexts engaged with a similar design motivation. Importantly, each student pursued a unique design project of their own choosing. This introduced variation into the research design, in contrast to a previous study (see 3.3.2.2, pp.149) where all students worked on the same project, while in this second study, the topics varied across students.

#### **1. Project Description: Final Year Individual Design Project**

The final year individual design project represents an important moment in the academic journey of design students. Spanning the course of one full academic year, this project (divided into two semesters, semester one and semester two) serves as a build-up experience that reflects the students' accumulated knowledge, design skills growth, and academic development over four years of study.

This project holds significant importance not only academically but also personally, as it allows students to take full ownership of their work. Each student independently selects a topic or theme that aligns with their interests, values, and career aspirations, ensuring a deep and meaningful engagement with the subject matter. As such, the project becomes a space

for self-expression and critical inquiry while also fostering responsibility and commitment. The primary aim of the project is to integrate and apply the diverse set of skills and knowledge gained throughout the design program within an original body of work. This includes exploring a specific area within design supported by both practical and theoretical investigations. Students are expected to conduct in-depth research, define valid and cutting-edge project scope, and implement appropriate methodologies and work plans.

The key learning outcomes include:

- The ability to define and structure a valid project using appropriate research and design methodologies.
- Planning, managing, and executing the project using critical thinking, technical analysis, and design processes.
- Applying project management strategies to ensure successful and timely delivery.
- Documenting and presenting the project using professional communication techniques, both written and visual, to convey its value, process, and outcomes.

First, semester one focuses on developing a theoretically informed foundation for the project. During this stage, students articulate the conceptual framework of their work and produce a written component that addresses its academic and creative underpinnings. Second, semester two builds on this foundation, guiding students through iterative design processes to create their final outcome.

This work is then publicly exhibited and presented in a manner that supports its creative and practical value. Given the depth and autonomy of this project, it was selected as the context for this study's emotional tracking tool. Students were asked to record and reflect on their emotional experiences throughout the duration of the project. The emotional journey captured here offer a rich and authentic insight into how students engage with complex, high-stakes design challenges, making this project an ideal setting for studying emotion in design education.

## **2. Participants**

A total of 41 final-year undergraduate design students from two universities, the German Jordanian University, Department of Design and Visual Communication, Jordan and the University of Strathclyde, Department of Design, Manufacturing, and Engineering Management, Scotland, participated in the study. All students have more than 4 years of experience in design.

Table 3-5 outlines the dynamics of student participation in the emotion tracking study across two semesters in both Scotland and Jordan. In the first semester, a total of 39 students participated, 26 from Scotland and 13 from Jordan. In the second semester, participation slightly decreased to 31 students, 21 from Scotland and 10 from Jordan. Notably, 28 students (19 from Scotland and 9 from Jordan) participated in both semesters, indicating a strong level

of ongoing engagement. However, 11 students (7 from Scotland and 2 from Jordan) withdrew before the second semester, while 3 new students (2 from Scotland and 1 from Jordan) joined during the second semester. One student from Scotland was excluded from the final dataset due to inconsistent responses that did not align with the intended format of the entries. After accounting for overlaps, withdrawals, new joiners, and exclusions, the final total number of student participants across the study was 41, with 27 from Scotland and 14 from Jordan. This breakdown reflects the fluid nature of participation while also demonstrating consistent engagement throughout the academic year.

*Table 3-5. Breakdown of Student Participation in the Emotion Tracking Study (Scotland and Jordan)*

| <b>Elements Breakdown</b>                 | <b>Scotland</b> | <b>Jordan</b> | <b>Total</b> |
|---|-----------------|---------------|--------------|
| Total Students Participating_1st Sem      | 26              | 13            | 39           |
| Total Students Participating_2nd Sem      | 21              | 10            | 31           |
| Both Semester (overlapping)               | 19              | 9             | 28           |
| 2nd Semester (withdrawal)                 | 7               | 4             | 11           |
| 2nd Semester (joined)                     | 2               | 1             | 3            |
| Total Students Excluded                   | 1               | 0             | 1            |
| <b>Final-Total Students Participating</b> | <b>27</b>       | <b>14</b>     | <b>41</b>    |

The use of the emotion tracker was introduced, in person and online, using an authorised platform, and each students signed a consent form and indicated their willingness to use the tracker and to be part of the study (see Appendix 4, p.410).

### **3. Tracking Process**

The primary task for the students was to record their emotions at the end of each week using the distributed hard-copy provided at the beginning of the semester. The researcher also collected this data each week to ensure consistency and accurate tracking. At the end of each semester, the researcher distributed a feedback sheet, functioning as a questionnaire, to gather additional insights. This aimed to explore further factors and aspects influencing the students' emotional experiences during the design process in addition to a semi-structured interview with 13 students. Given that, this exploratory study aimed to capture emotions throughout the full cycle of a design project. Spanning one year, the study followed the academic calendar divided into two semesters. After the first semester, enhancements were implemented based on students' feedback. These adjustments, including adding the 'other' option to questions two and three, though minor, were necessary and did not affect the overall reporting experiences.

In total, 82 trackers were collected across both semesters with 41 students from the two groups participating in the study.

## Tool Two

### 3.4.3 The Feedback Sheet

This part of the research presents the feedback sheet, which was conducted through a web survey by administering an online self-completion questionnaire. In this questionnaire, students answered questions by completing them themselves. This method is characterised, on one hand, by the use of fewer open-ended questions, relying more on closed questions that are generally easier and quicker for students to answer. This method is clear, concise, and easy to follow, helping minimise the risk of incomplete responses (Clark et al., 2021). In addition, this method's key strength lies in its data collection approach, which captures data at a single point in time rather than over an extended period. This allows researchers to gather quantitative or qualitative data across multiple variables, which can then be analysed to identify patterns, relationships, or associations among these data (Bryman, 2012). As a result, the feedback sheet includes various prompts within the questionnaire's four sections. Using an online approach as one of the study tools proved highly beneficial. The purpose is to help gather information that addresses the study's research questions. Each question is designed to collect specific data that, when analysed, will help better achieve the study's main aims.

For example, in exploring RQ1.6 (the meaning of emotions from the design students' perspectives), the digital format allowed students to type directly into boxed areas, encouraging open reflection in their own words without the pressure of the researchers (Bryman, 2012). The platform's flexibility, such as the ability to display one section per screen and allow scrolling through section related questions enhanced the experience and reduced effort overload, contributing to more thoughtful and complete responses. In addressing RQ2.3 (factors impacting students' design process), the questionnaire design's adaptability allowed for targeted questions to appear based on prior responses using automatic filter logic. This ensured that students only answered questions relevant to their experiences, maintaining engagement while capturing rich, individualised data. Finally, in evaluating RQ3.1 (the usability and reliability of the emotion tracking tool), the online questionnaire's automated data collection, filtering, and storage significantly reduced the risk of human error and made processing large volumes of responses much more efficient (Bryman, 2012; Clark et al., 2021). By eliminating the need for manual coding and allowing for structured and adaptive question design, the web-based tool proved to be both a practical and reliable method for capturing needed insights for the research.

Yin (2003) defines research design as *"A logical plan for getting from here to there, where 'here' may be defined as the initial set of questions to be answered, and 'there' is some set of conclusions (answers) about these questions. Between 'here' and 'there' may be found a number of major steps, including the collection and analysis of relevant data"* (Yin, 2003, p. 20). In alignment with Yin's framework, this study followed key components of research design to ensure a clear and purposeful methodological approach as follows:

- First, the study defined its propositions, which guide the research focus and determine the scope of the investigation. In this case, the central proposition is that emotions influence students' engagement and performance within the design process. This assumption shaped the direction of the research and informed participant sampling, leading to a focus specifically on students enrolled in design programs and taking part on the main taking study.
- Second, the study identified its units of analysis, which are essential for answering the primary research questions (Adu & Miles, 2023). These units defined specific factors such as emotions, design process stages, and student reflections and provided the foundation for structuring the feedback sheet and formulating the questionnaire content. Clearly defining these units helped ensure that the data collected would be directly relevant to the study's aims and support a meaningful analysis of the emotional dynamics within the design education context. Accordingly, the questionnaire units include:
  - Tracker Usability and Reliability.
  - Design Process-Related Emotions.
  - Factors Impact (External & Internal)
  - Emotional State.

Accordingly, this study involved 39 design students (25 from Scotland and 14 from Jordan) who already took part in the tracking study. The feedback sheet was created using Google Form and conducted over two semesters after students finished tracking their emotions after each semester (Figure 3-23). The two versions of the feedback sheet were necessary to identify differences that emerge as students progressed in their project. Hence, in the second version of the feedback sheet, a new unit of analysis was introduced, and additional questions were incorporated. This addition was informed by insights gained from the first phase of analysis of semester one data, which revealed new emotional phenomena that had not been previously considered. These emerging experiences highlighted the need to include new questions in the revised feedback sheet to ensure more comprehensive data collection in the second phase.

| Research Tool   | Students Participating  | Study Level   | Study Course  | Data Collection   |
|---|---|---|---|---|
|  |  |  |  |  |
| <b>Questionnaire</b><br>Google Form   | <b>39</b><br>25 Scottish<br>14 Jordanian  | <b>5<sup>th</sup></b><br>year design<br>students                                    | <b>Final<br/>Design<br/>Project</b>   | <b>2 Time</b><br>at the end<br>of each semester                                       |

Figure 3-23. Feedback Sheet Tool Details.

Table 3-6 below presents the questions included in the two versions of the feedback sheet. These questions were developed based on the previously discussed units of analysis and reflect the evolving focus of the study across both phases.

Table 3-6. Feedback Sheet Analysis Unites and Questions.

| Unit of Analysis                | Version (Semester) | Feedback Sheet Questions   |   |
|---------------------------------|--------------------|--|---|
| Tool Usability and Reliability  | V1 Semester One    | Did you enjoy tracking your emotions?  |   |
|                                 |                    | Did the 'Emotion Tracker' tool assist you in tracking your emotional experiences while designing?  |   |
|                                 |                    | Did you find the 'Emotion Tracker' helpful?  |   |
|                                 |                    | How did the 'Emotion Tracker' help you?  |   |
|                                 |                    | Why didn't you find the 'Emotion Tracker' helpful?   |   |
|                                 |                    | Do you have any suggestions to improve the 'Emotion Tracker' tool in the future?   |   |
|                                 | V2 Semester Two    | When did you use the 'Emotion Tracker'?  |   |
|                                 |                    | Did using the 'Emotion Tracker' influence your awareness of your emotional state during the design process?  |   |
|                                 |                    | Describe how effective the 'Emotion Tracker' tool was in helping you monitor and understand your emotions throughout the design process.   |   |
|                                 |                    | What challenges or limitations did you encounter while using the 'Emotion Tracker' tool?   |   |
|                                 |                    | On a scale of 1 to 5, how well does the 'Emotion Tracker' tool capture the nuances of your emotional experiences during the design project?<br><i>1 = Very Low, 2 = Low, 3 = Med, 4 = High, 5 = Very High</i>  |   |
|                                 |                    | Did you find the addition of the 'Other' option to the 'Emotion Tracker' helpful for expressing additional emotions?   |   |
|                                 |                    | Did you leave any place not filled with emotion?   |   |
|                                 |                    | Please explain why you left it empty.  |   |
| Design Process Related Emotions | V1 Semester One    | Do you think the emotions listed in the tracker are enough to express your emotional experience(s) while designing?  |   |
|                                 |                    | In your opinion, which emotion or emotions do you think should be included in the 'Emotion Tracker' in the future?   |   |
|                                 |                    | In your design experiences, which emotion or emotions used in the 'Emotion Tracker' do you believe lack relevance or are unnecessary to include: <i>(You can choose more than one)</i><br><i>Enjoyment, Relaxation, Anger, Frustration, Boredom, Joy, Hope, Contentment, Relief, Anxiety, Shame, Sadness, Disappointment, None</i> |   |
|                                 |                    | V2 Semester Two  | Do you think the emotions listed in the 'Emotion Tracker' are enough to express your emotional experience(s) while designing?   |
|                                 |                    |  | From your perspective, what other emotion do you believe is important to list in future versions of the 'Emotion Tracker'?  |
|                                 |                    |  | In your design experiences, which emotion or emotions used in the 'Emotion Tracker' do you believe lack relevance or are unnecessary to include: <i>(You can choose more than one)</i><br><i>Enjoyment, Relaxation, Anger, Frustration, Boredom, Joy, Hope, Contentment, Relief, Anxiety, Shame, Sadness, Disappointment, None.</i> |

|   |   |   |
|---|---|---|
|   |   | <p>What is the most emotionally challenging/difficult stage in the design process you encounter during your final design project? (You can choose more than one)</p> <p>Brief and specification, Research (Opportunity Identification), Concept Design, Design Development, Detail Design, Production, Other</p>  |
| <b>Factors Impact (External &amp; Internal)</b> | <b>V1 &amp; V2 Semester One &amp; Two</b> | <p>What external factors (i.e., something you can't control) affect you through your design process (you can choose more than one):</p> <p><i>Social Factors, Cultural Factors, Economic Factors, Technological Factors, Environmental Factors, Political, others.</i></p> <p>Considering your answer to the previous question, please provide examples for the selected factor.</p> <p>What internal factors (i.e., something you can control) affected you through your design process (you can choose more than one):</p> <p><i>Research Skills, Thinking Skills, Making Skill, Management Skills, Communication Skill, Emotional Regulation Skills, others.</i></p> <p>Considering the factors you selected in the previous question, please tell us how these internal factors affected you.</p> <p>Throughout the entire duration of your project, could you share a significant moment or occurrence that influenced your emotions, whether in a positive or negative way?</p> |
| <b>Emotional State*</b>                         | <b>V2 Semester Two</b>                    | <p>Did you encounter a state of 'Emotionlessness' during your project and its process?</p> <p>As a designer and based on your experiences, how do you interpret the concept of 'Emotionlessness'?</p> <p>Which of the following options closely aligns with your interpretation of 'Emotionlessness'? (You can choose more than one)</p> <p>Emptiness, Nothingness, Neutrality. Others.</p>   |
| * <i>New analysis unit</i>                      |   |   |

In the design process, a range of factors can influence and shape a designer's journey. Ho (2010) emphasises the concept of emotionalised design, underscoring the role that a designer's emotions play throughout the design process. These emotions are affected by both external and internal factors, which in turn influence how the process unfolds. External factors such as social, cultural, technological, and economic conditions are generally beyond the designer's control. In contrast, internal factors, including thinking skills, information processing, and project management abilities, can be developed and strengthened over time (Ho & Chau, 2016). The factors included in the feedback sheet were informed by Ho's study, as well as by skills directly related to the design process and elements outlined in the final year project description.

Hence, using an online self-completion questionnaire as a second tool to complement the cultural probe offers several practical advantages, particularly in terms of efficiency and consistency. Questionnaires are generally cheaper and quicker to administer, making them a cost-effective method for gathering data from a larger number of participants in a short period. They also eliminate interviewer effects such as bias or influence introduced by the presence of an interviewer and ensure no interviewer variability, which contributes to more consistent and comparable responses. Furthermore, questionnaires offer a high level of

convenience for respondents, allowing them to complete the form at their own pace and in their preferred environment. As a result, using the feedback sheet (Figure 3-24) alongside the tracker provides a structured, scalable way to collect data while maintaining participant comfort and accessibility. In contrast, one disadvantage of such methods is the limitation on length, as researchers must be mindful of respondent fatigue and therefore restrict the number of questions (Clark et al., 2021). This constraint can limit the depth and breadth of data collected. Additionally, there is a risk that students may submit incomplete responses or rush through the questionnaire, compromising data quality. The researcher also cannot be certain that the intended participant is the one completing the questionnaire. Moreover, once the questionnaire is distributed, it becomes inflexible, there is no opportunity to adapt or follow up based on participants' responses, nor to collect further data if needed (Bryman, 2012; Clark et al., 2021). Hence, more details and complete version of the feedback sheet can be found in Appendix 10, p.426.

The figure displays two screenshots of online feedback sheets. The left screenshot, titled 'FBS\_Emoational Experiences of Design Students Study\_ One Year Tracking\_Phase 1\_2023', is for a study conducted in 2023. It shows 'Section 3 of 7' with the following questions:

- Tool Usability and Reliability** (Description optional):
  - Did you enjoy tracking your emotions? \* (Radio buttons: Yes, No)
  - Did the "Emotion Tracker" tool assist you in tracking your emotional experiences while designing? \* (Radio buttons: Yes, No)
  - Did you find the "Emotion Tracker" helpful? \* (Radio buttons: Yes, No)
  - How did the "Emotion Tracker" help you? \* (Long answer text)
  - Why you didn't find the "Emotion Tracker" helpful? \* (Long answer text)
  - Do you have any suggestions to improve the "Emotion Tracker" tool in the future? \* (Long answer text)

The right screenshot, titled 'FBS\_Emoational Experiences of Design Students Study\_ One Year Tracking\_Phase 2\_2024', is for a study conducted in 2024. It shows 'Section 7 of 9' with the following questions:

- Emotional State** (Description optional):
  - Did you encounter a state of "Emotionlessness" during your project and its process? \* (Radio buttons: Yes, No)
  - As a designer and based on your experiences, how do you interpret the concept of "Emotionlessness"? \* (Long answer text)
  - Which of the following options closely aligns with your interpretation of "Emotionlessness"? (You can choose more than one) \* (Checkboxes: Emptiness, Nothingness, Neutrality, Numbness, Other...)

Figure 3-24. Online Feedback Sheet Screenshots (Questionnaires). Left: Version 1, Semester One; right: Version 2, Semester Two.

## Tool Three

### 3.4.4 *Semi-Structured Interview*

While the questionnaire played an important role in collecting broad, quantifiable data on students' emotional experiences during the design process, it presented several methodological limitations that made it necessary to introduce semi-structured interviews as another complementary method. The nature of this research, dealing with highly subjective emotional experiences and the complex relationship between individuals and their design process, requires a deeper approach than the questionnaire alone could offer. Questionnaires are inherently limited in their ability to provide deeper into personal experiences; they cannot prompt for clarification, explore emerging themes, or adapt questions based on individual responses (Bryman, 2012). Additionally, challenges such as the risk of missing or superficial data further constrained the depth of insight that could be gained (Bryman, 2012; Clark et al., 2021). Given the variety of elements influencing emotional experiences in design ranging from personal, contextual, and process-related factors a more flexible and open-ended method was required. Semi-structured interviews filled this gap by allowing the researcher to engage directly with students, explore unanticipated themes, and build a richer, more detailed understanding through an inductive approach. This transition to a more interpretive method ensured that the study remained responsive to the topic's complexities and could uncover subtleties that structured instruments like questionnaires can often not capture. In addition, semi-structured interviews were chosen for this exploratory study due to their flexibility and adaptability. This method combines predetermined questions with the freedom to explore unexpected insights that emerge during the conversation. It allows interviewers to adjust the order, wording, and inclusion of questions based on the individual interviewee's responses and level of comfort, making it easier to gather in-depth and context-rich information (Arksey & Knight, 1999).

Semi-structured interviews were conducted with 13 fifth-year design students (7 from Scotland and 6 from Jordan). The interviews lasted between 25 and 45 minutes to answer 15 questions, depending on each student's engagement and availability. Interviews took place either in university spaces or online, based on the student's preferences and time constraints. Although Arabic is the native language in Jordan, all interviews were conducted in English, as Jordanian students enrolled in the design department and complete their studies in English. All interviews were audio-recorded and transcribed prior to analysis to ensure accuracy and facilitate in-depth data exploration (Figure 3-25).

| Research Tool   | Students Participating  | Study Level   | Study Course  | Interview Duration  | Interview Language  |
|---|---|---|---|---|---|
|  |  |  |  |  |  |
| <b>Semi-Structured Interview</b>  | <b>13</b><br>7 Scottish<br>6 Jordanian  | <b>5<sup>th</sup></b><br>year design<br>students                                  | <b>Final Design Project</b>   | <b>25-45 Min</b><br>at end of<br>the study year                                     | <b>English</b>  |

Figure 3-25. Semi-Structured Interview Tool Details.

To explore the research questions, the interviews were designed to create an open conversation, allowing students to share their personal thoughts and perspectives on the experiences they had while tracking their emotions in their own words (Figure 3-26). As a result, questions investigated four analysis units as follows:

- Questions investigating the analysis units of *Emotional Reflection and Expressions* included the following:
  - *What do you do to repeat emotions you've previously experienced, whether they were positive or negative (as negative can sometimes motivate us, and positively can encourage us as well)?*
  - *In case it happened and in your opinion, what is the reason behind being in an Emotionlessness State during the design process?*
  - *From your perspective, why do you think anger considered an irrelevant emotion in the design process?*
  - *Do you think jealousy is positive or negative?*
  - *From your perspective, what is the meaning of contentment?*
  - *'Fine', appear while expressing emotion, from your perspective, what does it mean 'fine'?*
  - *You used the emotion tracker during the last one year, How can you ensure the honesty of the emotions you've recorded with the Emotion Tracker*
- Questions investigating the analysis units of *Design Process and Design Project* included the following:
  - *How does the perception of progress or setbacks in the design process affect your emotional states?*
  - *How does the perception of success or failure influence your emotional state throughout the design project?*
  - *What is the most emotionally challenging/difficult stage in the design process you encounter during your final design project? Why?*

- Questions investigating the analysis units of *Factor Impact* included the following:
  - *Factors affect us, whether internal or external. How do you overcome the external and internal factors impacting your design process?*
- Questions investigating the analysis units of *Education and Future Feedback* included the following:
  - *From your point of view, how can lecturers and supervisors support design students (your) emotional experiences while they're (you're) working on a design project?*

In addition to the questions focused on the study's defined units of analysis, general questions were also incorporated to provide broader insights and uncover additional, potentially valuable information. These questions aimed to enrich the depth of understanding and contribute to a more comprehensive knowledge base, including:

- *Do you think it is important to track your emotions?*
- *When you look back, it's one year now and it's finished, you already have the results. What's your emotion?*
- *Do you have anything you want to add, any comments or feedback, you want to share about the whole experience of tracking, using the tracker or your emotional state, etc?*

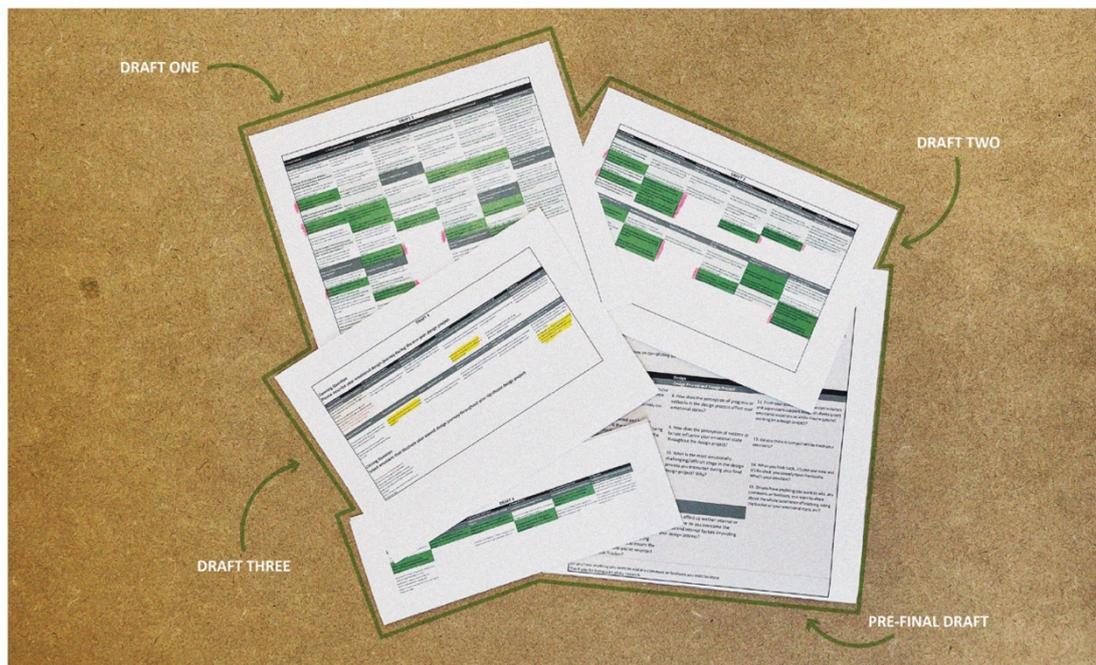


Figure 3-26. Interview Question Clustering and Sorting Process.

## Part Two: Verification Study Methodology

The second part of this chapter aimed to employ methods to validate the research findings generated from the earlier exploratory phase. In research, establishing validity is essential to ensure the integrity and credibility of the conclusion drawn. Following Guba and Lincoln's (1994) framework, research should address key aspects of trustworthiness by evaluating credibility, transferability, dependability, and confirmability. Given that, by incorporating focus groups and workshops as additional methods, this study was able to test how appropriate the findings were (credibility), whether they could be relevant in educational contexts (transferability), and whether the results could be consistently interpreted over time (dependability). Furthermore, engaging design experts and tutors in reviewing the research outcomes also allowed for the assessment of face validity (Bryman, 2012), ensuring that the questions and constructs used throughout the study intuitively reflected the emotional experiences of design students. Bryman's refers to face validity as the extent to which a measure appears to reflect the concept it aims to assess and it is typically judged intuitively by others, often individuals with relevant experience or expertise, who evaluate whether the measure seems appropriate for its intended purpose. This multi-faceted approach to verification reinforced the research's robustness and strengthened the reliability of the conclusion (Bryman, 2012; Clark et al., 2021).

Therefore, this research is concerned not only with generating results but also with embedding verification within the process itself, focus groups and workshops were considered key methods. Rather than relying on individual interviews for verification, the research prioritised the dynamic and provocative exchanges that occur in such settings, where participants challenge, question, and argue the researcher and each other's views. This interactive approach offers a deeper insight into participants' opinions, enabling them to discover one another's assumptions and collectively uncover what holds significance for them.

On one hand, a focus group is a qualitative research method involving a small group of participants, typically four or more, brought together to discuss a specific topic in depth. Originally developed from the focused interview technique, the method has been increasingly applied in social research. Unlike individual interviews, focus groups emphasise interaction and collective meaning-making, allowing participants to respond to and build upon each other's views (Bryman, 2012). This dynamic can lead to new insights as individuals reflect on and potentially revise their perspectives during the conversation. Focus groups are valued for their ability to surface diverse viewpoints and offer a more naturalistic glimpse into how people collaboratively construct meaning around shared experiences (Clark et al., 2021; Stupińska, 2018).

On the other hand, as qualitative research is increasingly used in social and psychological research (Guba & Lincoln, 1994), workshops are considered promising tools for collecting data and knowledge sharing (Ørngreen & Levinsen, 2017). Studies employ workshops to build

and implement ideas and suggestions as part of a multimethod approach (Storvang et al., 2024). Based on the literature review done by Ahmed and Asraf (2018), workshops are recognised as a valuable qualitative research approach that promotes deep participant engagement, collaborative learning, and constructive feedback as key elements in enhancing the credibility and depth of research findings. The interactive and prolonged nature of workshops deepen trust between facilitators and participants, encouraging the open exchange of rich, insightful data. Additionally, workshops allow for purposive sampling (Ahmad & Wilkins, 2025; Clark et al., 2021; Tajik et al., 2025) of information rich participants and facilitate both persistent and participant observation, with the facilitator actively contributing as a research instrument. These qualities make workshops a powerful method for generating contextual insights and outcomes that strengthen the study's credibility.

Adopting these selected qualitative research approaches to uncovering the external emotional dimensions of meaning-making makes them valuable methods for gaining insight into the understandings that emerge around the phenomena of the exploratory study highlights.

### 3.5 Shaping the Verification Methods

Building on the importance of face validity and the need for trustworthiness to serve the purpose of this research, appropriate methods were selected to achieve these goals. Therefore, preparations for conducting a workshop that include focused groups began, marking the last method in this research and a milestone in the verification process. The rationale for adopting this methodological approach lies in the strength of focus groups and workshops to generate meaningful, in-depth data. Focus groups bring together experts with diverse viewpoints and shared experiences, encouraging open dialogue and in-depth discussion around a specific topic (Słupińska, 2018). Similarly, workshops offer a dynamic and provocative space that enhances engagement and promotes constructive feedback, resulting in rich, insightful data and knowledge (Ørngreen & Levinsen, 2017). These methods encourage the emergence of insights, as individuals reflect on and potentially revise their perspectives during the conversations.

The preparation for the workshop was guided by insights drawn from the first part of the study, where the analysis revealed anger as one of the emotions needing further exploration (see 4.6, pp.288). While chapter four elaborates more on this rationale, this finding helped shape the workshop's central purpose and conceptual direction. To maintain an ethical and secure setting aligned with university regulations, the session was scheduled during working hours and held on campus at the University of Strathclyde, ensuring participant safety and readiness in case of any emergencies.

Accordingly, the facilitated workshop format provided a flexible environment that encouraged participants to engage with materials, prompts, and each other in a highly interactive setting. The workshop was not only a site for data collection but also an intentional

space designed to provoke reflection, interaction, and engagement with the theme of anger in the design process. The planning for the workshop is divided into three planning phases as follows (Figure 3-27):

1. Preparation: This phase includes defining the workshop's purpose and concept, time and place, communication and advertisement material, targeted list of participants, activities, materials, structure and design approach, and assistance roles.
2. Engage: Workshop activity structure and timeline, prompt and questions, create material and prints, and place and set up the workshop room, running the workshop.
3. Reflect: Cleaning up, following up, collecting insights and notes.



Figure 3-27. Workshop Planning Steps.

## 3.6 The Angry Design Workshop

The Angry Design Workshop was conducted at the University of Strathclyde on November 27, 2025. This workshop served both as a verification method and as a participatory environment to explore how anger can be constructively integrated into the design process. Focusing on anger arises from a gap identified in students' current design processes, where both preliminary and main study analyses consistently revealed anger as the least reported and least intensely experienced emotion, despite the importance of such emotion in human experiences. This study aims to contribute answers to RQ3.2, RQ3.3 RQ3.4 (see Figure 3-1, 3.1, p.131).

Drawing inspiration from facilitated workshop methodologies (Ørngreen & Levinsen, 2017), the structure was designed to promote active engagement, collective reflection, and creative insight among professionals and academics in the design field. Ahmed and Asraf (2018) suggested recommendations to increase the utility of the workshop, including:

- Workshops should have activities allowing participants to interact, learn collaboratively, and be engaged.
- The facilitator must create an environment where participants feel their voices are important. The facilitator may use question prompts, cues, or activities to provoke participants to respond.
- The workshop activities must be relevant to the workshop's main objective.
- Ethical considerations must be considered, e.g. having the participants sign the informed consent form before the workshop. The facilitator must inform the participants that their responses will be recorded but not shared with anyone else.
- The workshop should incorporate field notes and multiple observers to enhance the credibility and trustworthiness of the data (Ahmed & Asraf, 2018, p. 5).

The workshop brought together eight participants from diverse design backgrounds, including researchers, tutors, and practitioners. The group represented a broad spectrum of design expertise with experience ranging from 3 to over 27 years. The session lasted 1.5 hours and was scheduled at the end of the academic semester. The workshop was structured into four thematic sections comprising nine questions; all centred on the theme of anger in the design process. This format supported sustained openness and a structured approach at the same time. Within this broader structure, elements of focus group methodology were purposefully embedded, particularly in Part Three and Part Four of the session, where participants discussed questions in pairs before sharing with the larger group. Conducted face-to-face (F.T.F) at the Department of Design, Manufacturing, and Engineering Management (DMEM), room JW707, the workshop environment was intentionally curated to support rich discussion and emotional engagement (Figure 3-28).



Figure 3-28. Workshop and Focused Group Tool Details.

During the workshop, the researcher observed the groups dynamics, shifts in opinions, and the ways participants collectively negotiated and reshaped their understanding of anger in design. The collected data aimed to examine the emotion of anger within the context of design education and practice and explore various approaches including, usage, strategies, prior experiences, and examples related to anger. Accordingly, the data was collected in various formats, including text, audio recordings, photographs, notes, and observational records.

By merging the interactive qualities of a facilitated workshop with the dialogic interaction-focused strengths of a focus group, the session generated both insights and socially co-constructed knowledge. This blended approach proved especially valuable for capturing the emotional, pedagogical, and professional dimensions of how anger can be experienced and understood productively in contemporary design contexts.

### 3.6.1 Preparation (Pre-Workshop)

A visual identity was developed for the workshop by creating branded posters, email invitations, and promotional materials. These were shared via institutional communication channels and on social media platforms such as LinkedIn and Instagram, targeting individuals within the design community (Figure 3-29). Following this outreach, Out of 34 expressed interests, 8 participants were confirmed to attend, which was intentionally limited to allow for a manageable and high-quality group discussion.

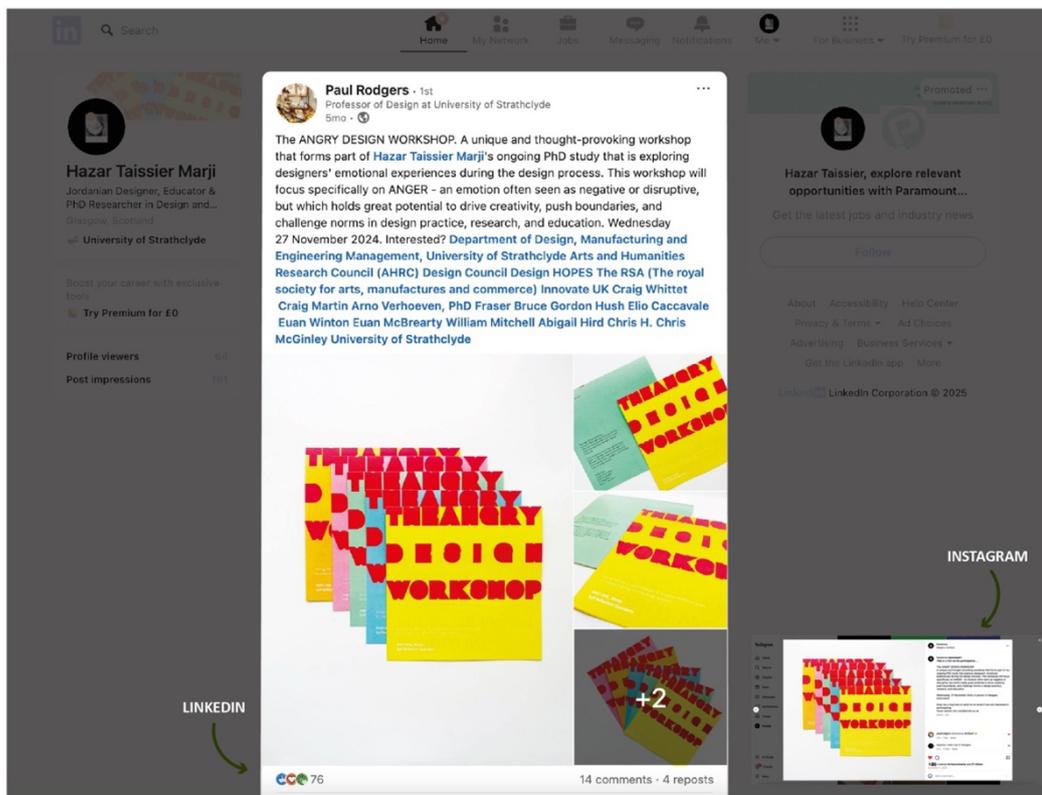


Figure 3-29. Social Media Advertisements (Instagram and LinkedIn).

### 3.6.1.1 Workshop Set Design Theme

As part of the preparation, extensive planning was dedicated to designing, printing, and assembling all physical materials and props that would shape the workshop environment. The setting was intentionally styled to evoke the atmosphere of a restaurant, transforming the space into a highly immersive and emotionally engaging experience (Figure 3-30).

This thematic choice was made to ensure that the environment became an active component of the workshop, encouraging participants to interact with the questions and prompts, as well as the physical surroundings. The researcher custom-designed all materials from the table setups to the printed cards and visual elements to align closely with the workshop's conceptual focus on anger in design. The venue was fully arranged in the morning before participant arrival, allowing time for careful setup and atmosphere creation. To ensure smooth attendance, reminder emails and calendar invitations were also sent to participants in advance.

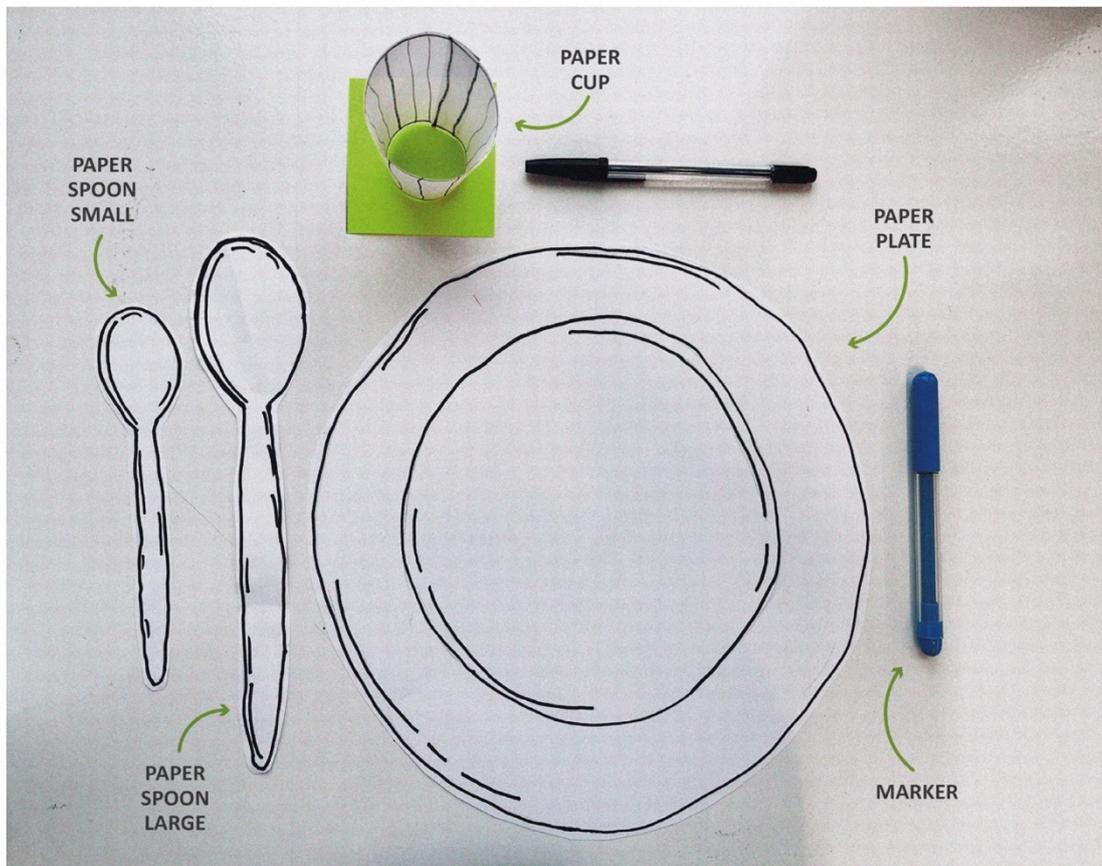


Figure 3-30. Preparation and Table Setup.

### 3.6.1.2 Workshop Participants

The participants included design tutors, researchers, and professionals from diverse backgrounds such as visual communication, ethical design, sustainability, product design, and architecture. Two participants were international, while the remaining participants were from the UK. Before the workshop, ethical approval forms were signed, and consent was obtained for recording and photographing the event.

### 3.6.1.3 Workshop Roles and Documentation

To ensure the workshop was well-documented and smoothly facilitated, three colleagues were recruited to assist with note-taking, photography, and videography, enabling comprehensive coverage of the event for analysis and archiving (Figure 3-31). These roles were important in capturing not just verbal data, but also archiving workshop dynamics that are particularly valuable in workshop-based verification research.



Figure 3-31. Researcher and the Helping Colleagues.

### 3.6.2 Engage (During the Workshop)

The workshop was carefully structured into four sequential parts (Figure 3-32), each designed to guide participants through personal reflection, focused group engagement, and collective discussion. This structure allowed for a balance between individual introspection and group interaction, ensuring that diverse perspectives could surface organically while also encouraging collaborative sense-making. The activities moved from expressive and silent engagement toward open dialogue, mirroring the research aim of exploring how anger can be recognised, understood, and potentially harnessed within the design process. Below is a breakdown of the workshop structure, along with the intended purpose of each part.

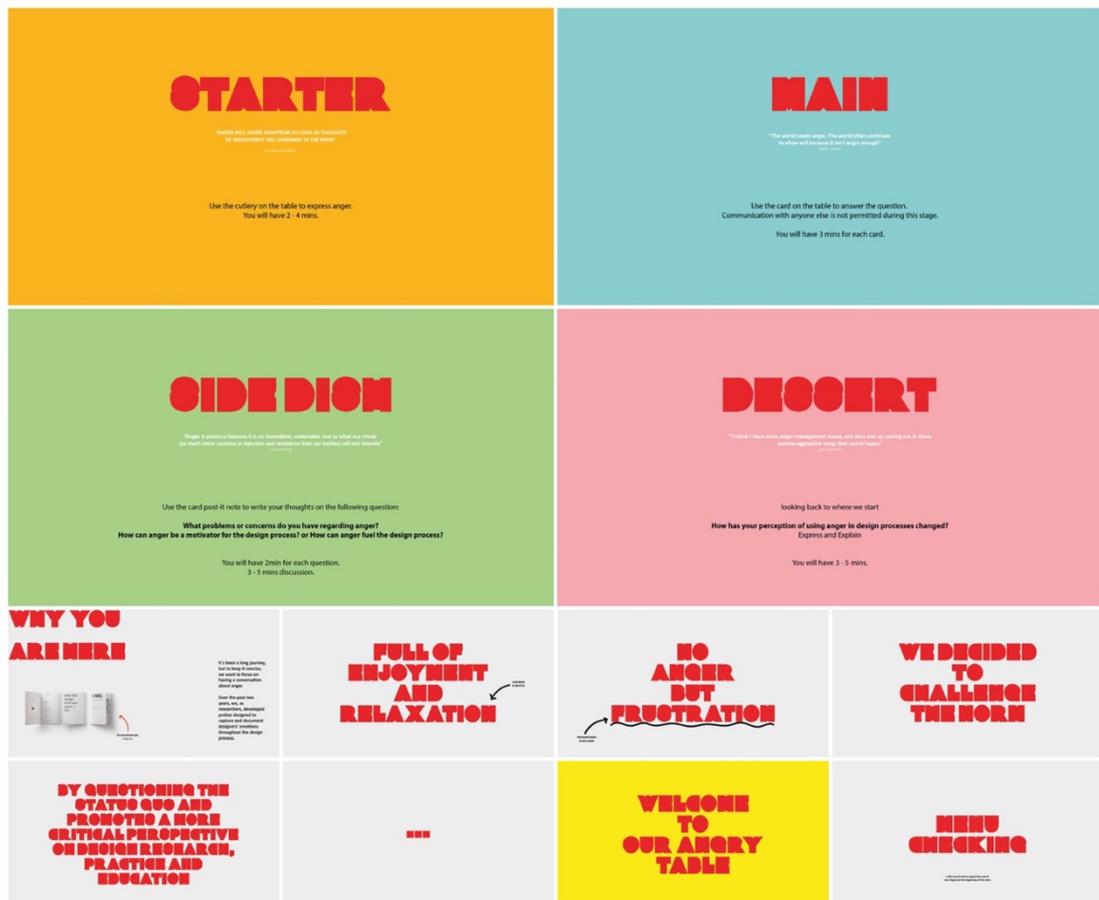


Figure 3-32. Workshop Four Parts and Presentation Slides.

The workshop began with a brief introduction outlining its purpose, structure, and ethical considerations. Participants were encouraged to be open, reflective, and engaged.

### 3.6.2.1 Part One: Speak Your Mind

To break the ice and ease participants into the emotional theme of the workshop, the session began with a warm-up activity introduced by the researcher:

**‘Use the cutlery on the table to express anger.’**

Participants were invited to respond to this using the designed cutlery tools and supporting materials provided on the table. These custom-made objects were intentionally created to align with the workshop’s thematic focus and served as the medium through which participants could physically express anger. Without any prior discussion or explanation, this activity encouraged raw, instinctive engagement with participants’ understanding of emotion. It allowed participants to express their personal associations with anger in a spontaneous and unfiltered way, free from the influence of structured questions or group dialogue. This embodied, sensory-led exercise set the tone for the rest of the session by grounding the exploration of anger in direct human experience (Figure 3-33).

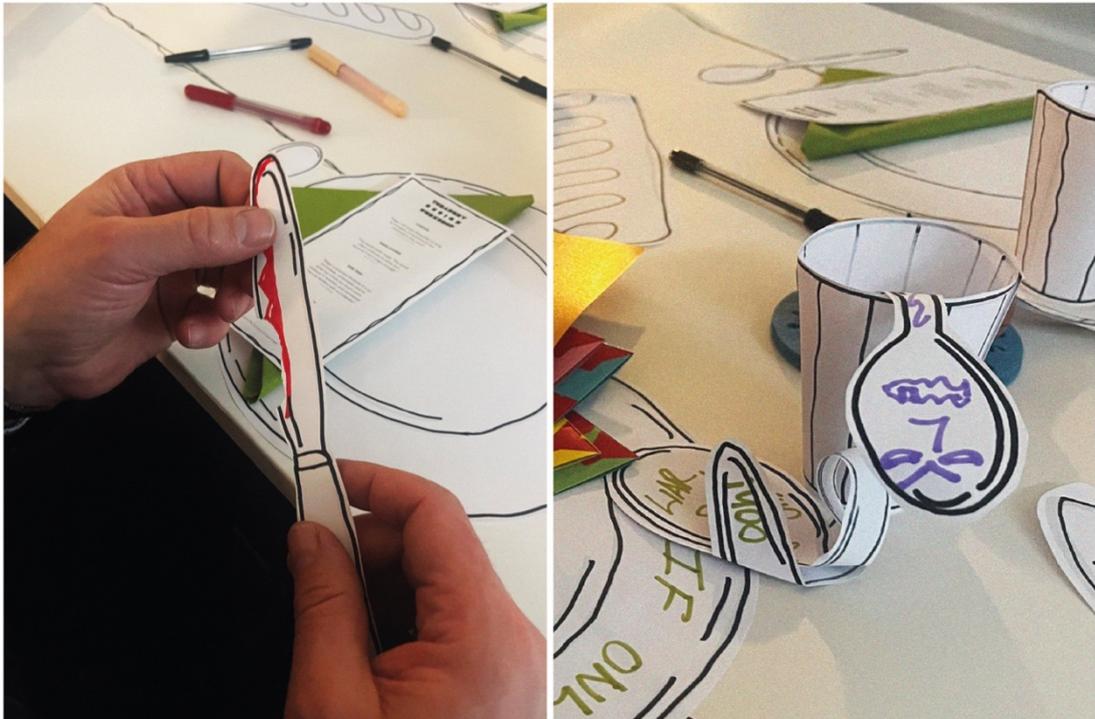


Figure 3-33. Participants Expressing Anger Using the Paper Cutlery.

### 3.6.2.2 Part Two: Self-Reflection Questions

Participants were given 20 minutes to answer five reflective questions related to anger in the design context, its promotion, perception, potential in education and personal experiences (Figure 3-34). Responses were written individually, without sharing, to maintain authenticity and reduce peer influence. This silent part aligns with the facilitated workshop method's emphasis on 'participant-led sense-making' and the use of participant introspection for deeper insight. Each question was presented by one coloured card as follows:

- Question One (yellow card): Should we promote anger in today's design process? Why?
- Question Two (blue card): How can we change the perception of anger?
- Question Three (green card): If we are going to promote anger within design practice/education, how can we create a space for students to explore and express anger productively?
- Question Four (pink card): How can you incorporate/imagine anger into your design practice/research/teaching/education methods? (Give an example that illustrates that)  
*Further details: prior research suggests different aspects of anger, including but not limited to anger at the tutor, at the process, at oneself, at the context/issue, other...)*
- Question Five (orange card): In your experience, have you encountered situations where anger has led to creative breakthroughs? Or do you know of a situation where anger has led to creative breakthroughs? Can you share an example?

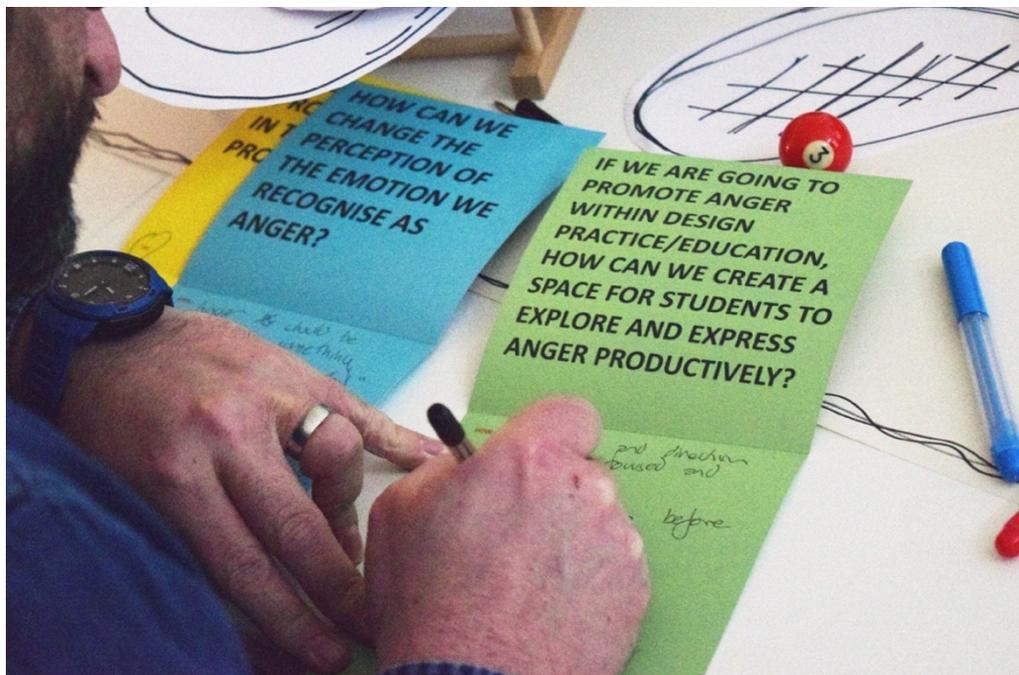


Figure 3-34. Participant Filling the Self-Reflection Cards.

### 3.6.2.3 Part Three: Focused Group and Open Discussions

In this phase, participants were paired in groups to discuss two key questions within 20 minutes:

- What problems or concerns do you have regarding anger?
- How can anger be a motivator for the design process? or How can anger fuel the design process?

Each group engaged in internal discussion before presenting their insights to the full group using a posted and open discussion session. This method combined focus group dynamics with facilitated workshop goals using group interaction to elicit co-constructed knowledge (Figure 3-35).



Figure 3-35. Focused Group Discussion in Pairs.

### 3.6.2.4 Part Four: Change in Perception

The final open discussion invited participants to reflect on how their perception of anger had shifted during the session. This served as a moment of collective synthesis and allowed the researcher to observe shifts in emotional and intellectual attitudes, a key goal in qualitative verification. As workshop closure, participants were once again invited to reflect using the cutlery and materials provided on the table to respond to the final question:

**‘How has your perception of anger changed after the workshop?’**

### 3.6.3 Reflect (Post Workshop)

Following the workshop, participants were invited to stay for refreshments and informal conversation, which helped reinforce the sense of community and trust fostered during the session. This informal time also allowed the researcher to gather additional non-verbal feedback and observe lingering reflections. A final thank-you was extended, and the session concluded. All materials and recordings were archived for analysis (Figure 3-36).

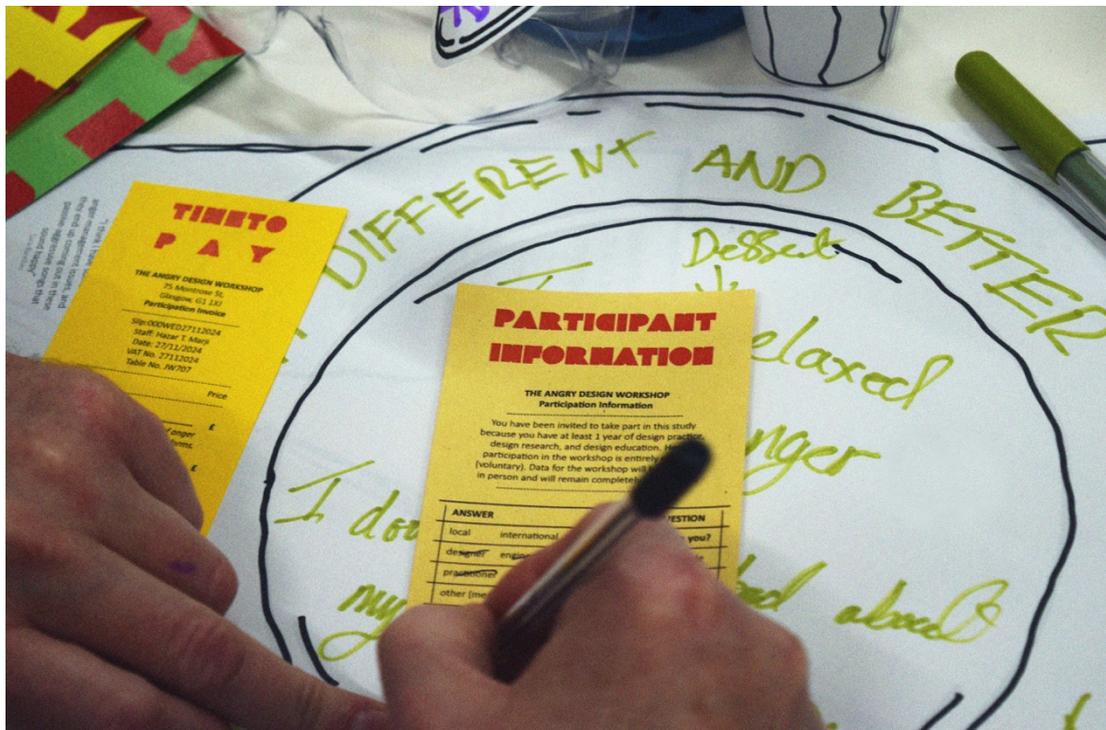


Figure 3-36. Participants Filling in their Information.

### 3.7 Summary

Overall, this chapter outlines the research methods and tools employed in the studies that form the basis of this research. Figure 3-37 illustrates the research process's different components and summarises the methods used. The study is grounded in a mixed-methods approach, combining qualitative and quantitative strategies to ensure a comprehensive exploration of the research questions.

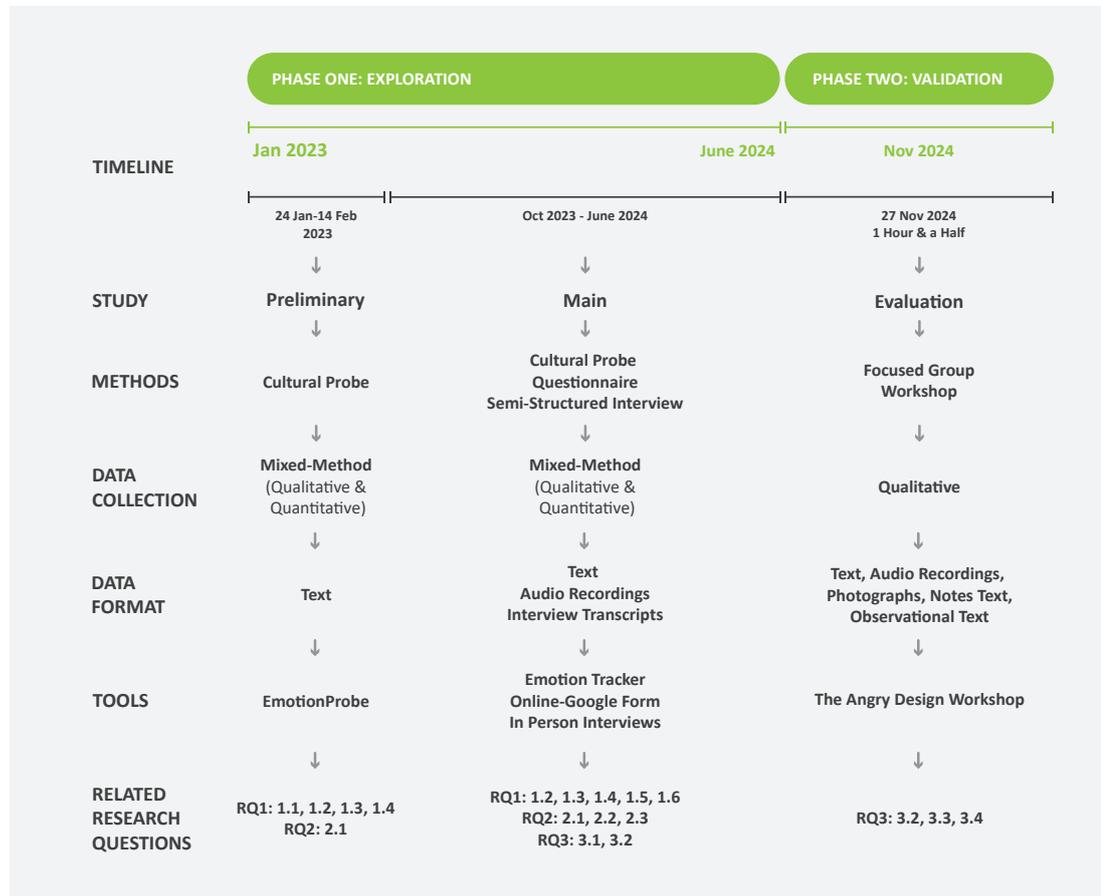


Figure 3-37. Research Methodology: Methods, Timeline, and Tools.

This study employed a mixed-methods approach to investigate design students' emotional experiences across different design student groups. Four complementary research tools, cultural probes, a web-based questionnaire, semi-structured interviews, a focused group, and a workshop, were strategically used to gather rich, mixed data. The cultural probes captured emotional reflections from students at various design process stages in Jordan and Scotland, offering insight into how design emotions evolve over time and within different project periods. The web questionnaire provided quantifiable trends, while interviews allowed deeper, spontaneous elaborations on emotional experiences. Finally, the focus group and workshop served as verification stages, bringing in critical perspectives from experienced design tutors and practitioners.



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*This chapter presents the research findings from both the exploratory and validation studies, offering a detailed analysis of students' emotional experiences throughout the design process. Using data from probes, questionnaires, and interviews, the chapter explores emotional patterns, key moments, and recurring themes, supported by visualisations and guided by the academic emotions framework.*



## 4.1. Introduction

This chapter presents the results and analyses of the studies conducted throughout this research. The chapter is structured into two main parts: Part One: Exploration Studies Analysis, and Part Two: Verification Studies Analysis, reflecting the research's sequential stages and process.

**Part One** focuses on the exploratory phase. Beginning with the EmotionProbe results, a tool developed to identify emotional responses across the various stages of the design process. Accordingly, the first section of part one presents results related to the emotional spectrum, patterns of emotional manifestation, and the relevance of academic versus design-specific emotions. Then, the Emotion Tracker results, the second research tool used in the main study, are presented by capturing emotional experiences in real-time during students' engagement with their design project over the course of a year. The results of the second section of part one reveal both collective trends and variations in emotional responses, helping to identify key factors influencing emotional engagement and achievement across diverse design process stages within an educational context. Additional insight is gathered from students using the feedback sheets to offer a broader perspective on emotional states, tool effectiveness, and the design process, various factors. The exploratory part concludes with results from semi-structured interviews about students' emotional reflections, experiences with the design process, and their perceptions of the role of emotion in learning and their design development. As a result, greater focus and interest were directed toward the anger emotion, as it emerged as the least expressed and nearly absent emotion within the design process. **Part Two** transitions to the verification phase, where the Angry Design Workshop serves as an effort to test and reflect on earlier findings. This part examines how anger can be productively addressed and incorporated into design education. The workshop's structure, comprising expressive activities, reflective prompts, and focus group discussions, facilitates an in-depth understanding of how anger can be perceived, engaged, and integrated within the design process practices. The analysis sheds light on shifting narratives around anger, its potential role in fostering stronger engagement, and how the design education environment might support the emotional aspect in design learning.

Together, these results build a comprehensive picture of how emotions can be experienced, expressed, and potentially leveraged within the design education context. To ensure consistency and depth across the different research tools and methods, all collected data, from the EmotionProbe, Emotion Tracker, Feedback Sheets, Semi-Structured Interviews, and the Angry Design Workshop, were recorded, transcribed, organised, and coded using a structured analytical framework. Both quantitative and qualitative responses were compiled and processed using spreadsheets (Excel) and analysis tools to enable the identification of emotional patterns, challenge points, and moments of engagement throughout the design process. This integrated approach allowed for cross-comparison between data sources and supported a comprehensive understanding of how students navigated, experienced, and expressed emotions during their design process.

# Part One: Exploration Study Analysis

## Preliminary Study Results

### 4.2 The EmotionProbe Results

The EmotionProbe is the initial step in data collection, integrating quantitative and qualitative methods (see 3.2, pp.132). A key feature of this tool is its capacity to showcase diverse analytical approaches, offering meaningful insights into the emotional experiences of design students' design process. The Probe address the following questions:

#### RQ1. What emotional experiences do design students encounter throughout the design process?

*RQ1.1. What range of emotions do design students identify when designing?*

*RQ1.2. How do different emotions manifest in the students' design process?*

*RQ1.3. Are the students' emotional experiences pleasurable or otherwise?*

*RQ1.4. What are the dominant emotions experienced by design students?*

#### RQ2. How do the design students' emotional experiences affect their design process?

*RQ2.1. What are the relationships between students' emotions and their design process stages?*

#### 4.2.1 Emotional Spectrum

First, the results regarding the emotion ranges showed a huge spectrum recorded, including other emotions added by the students. In total, 50 emotions were reported by Jordanian and Scottish students during two sessions (Figure 4-1). Among those 47 were already part of the wheel, and 3 new emotions were mentioned by students: stress, nervous, and happy. Notably, one emotion, anger, was not reported by any student, despite being included in the emotion wheel provided (Marji et al., 2024a). From the figure, relaxation and excitement emerge as the most consistently reported emotions, indicating a general sense of pleasure throughout the design process. Hopefulness and satisfaction are also commonly expressed, suggesting that despite the complexity and uncertainty inherent in design, students often maintain a positive and calm emotion. However, anxiety, confusion, scared, and scepticism appear with noticeable frequency during the design process, highlighting emotional fluctuations and the pressure students may feel at certain stages.

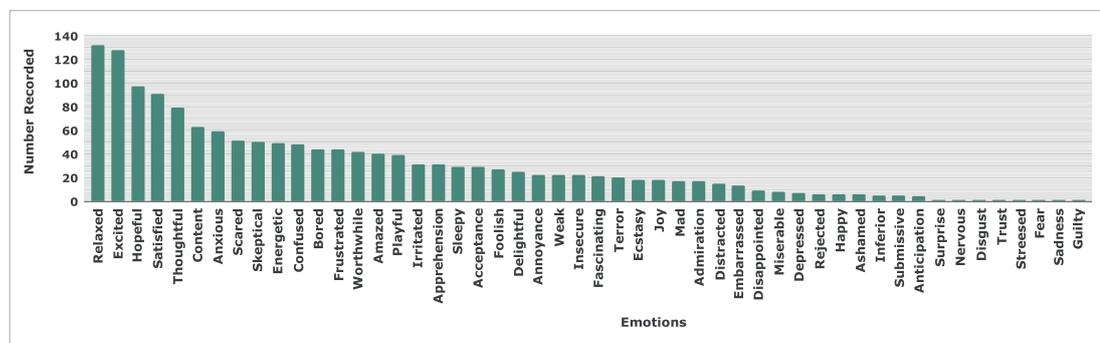


Figure 4-1. Emotions Consistency Reported by Students.

#### 4.2.1.1 Design Process Stage One: Brief and Specification

Figure 4-2 presents the spectrum of emotions reported during the first stage of the design process, brief and specification, which recorded 39 different emotions. The figure displays a wide range of emotional responses measured by the frequency of their occurrence.

Excitement is the most dominant emotion, recorded (39) times, indicating a sense of engagement at the project's beginning. This is followed by relaxed with (30), anxious (28), and thoughtful (23), indicating that while the initial stage is energising for many students, it is also accompanied by moments of reflection and underlying tension. Negative emotions begin to emerge with scared (20), confused (19), and sceptical (17), reflecting early uncertainties and doubts about the project ahead.

A mid-frequency cluster of emotions appears with lower but notable frequencies, including hopeful (15), apprehensive (14), content (13), and satisfied (12), suggesting a fluctuating emotional landscape in which optimism and unease coexist. Further down the spectrum, emotions such as boredom and sleepiness appear, with each mentioned (8) times, representing a more disengaged tone for some students. Emotions like playful, worthwhile, amazed, and frustrated appear with (7) mentions each. Followed by weak, distracted, joy, and acceptance, which are reported (5) times each, while others, such as foolish and insecure, appear with (4) mentions. The low-frequently reported emotions, each recorded between one and three times, include irritated, terror, depressed, annoyance, disappointed, mad, shame, delight, submissive, misery, embarrassment, ecstasy, anticipation, and rejection.

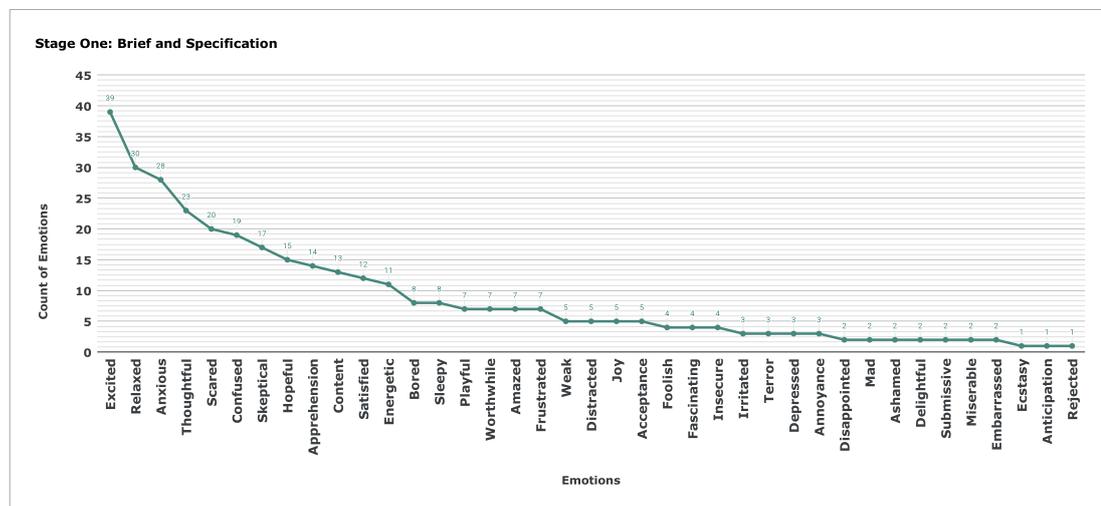


Figure 4-2. Design Process Stage One: Brief and Specification Emotions Range.

#### 4.2.1.2 Design Process Stage Two: Research (Opportunity Identification)

Figure 4-3 displays the range of 37 different emotions reported by a student during stage two of the design process: research (opportunity identification). This stage shows a prominent shift from the highly energised start of the project into a more investigative approach. The most frequently reported emotions are hopeful and relaxed, each recorded (31) times, indicating a sense of calmness and deactivation during the research phase. These are followed closely by excited (24), energetic (19) and thoughtful (15), reflecting continued engagement as the student explores opportunities and gathers insights.

Mid-frequency emotions include satisfied (13), playful (12), and amazed (11). They are followed by a range of mid occurrences between (8) and (9) times, including frustration, boredom, confusion, scared, and sceptical as negative emotions and fascinating, worthwhile, and content as positive ones. However, this suggests that negative emotions occur less frequently than positive ones.

Lower-frequency emotions include anxious, foolish, sleepy, ecstasy, acceptance, admiration, and terror, each reported between (4) and (7) times. A long tail of infrequent emotions follows, including irritated, delighted, insecure, distracted, inferior, joy, embarrassment, disappointment, and happy (2) and (3) times, as well as a small cluster of emotions recorded only once, such as miserable, depressed, apprehensive, weak, and mad.

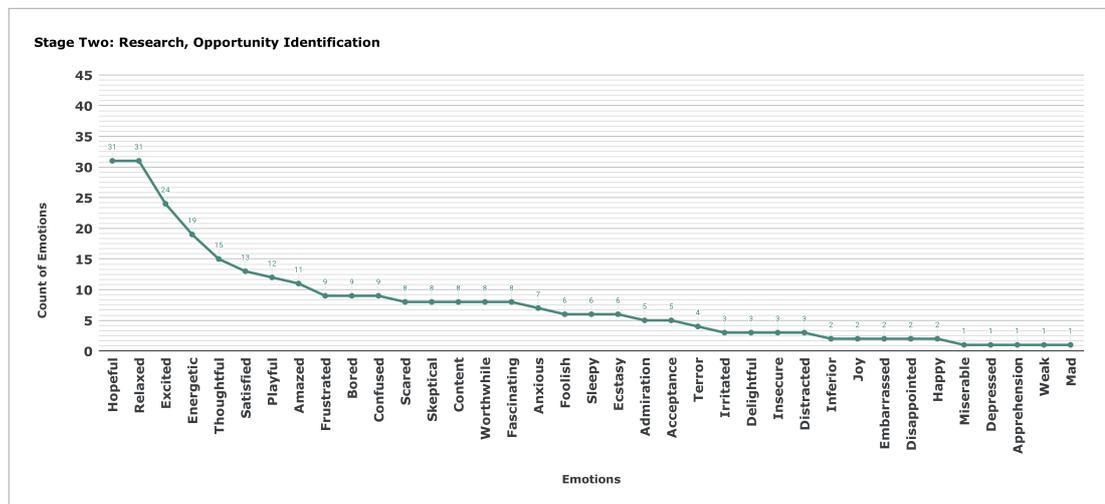


Figure 4-3. Design Process Stage Two: Research (Opportunity Identification) Emotions Range.

### 4.2.1.3 Design Process Stage Three: Concept Design

Figure 4-4 represents the widest emotional range observed in the study, with 43 distinct emotions reported during the concept design stage of the design process. At this point in the process, students begin generating and developing initial ideas, which is reflected in a mixture of high energy, confidence, and emerging self-doubt. Excitement is the most frequently reported emotion, appearing (27) times, indicating a strong emotional engagement during this phase. This is followed by relaxed (22) and hopeful (19), suggesting that students generally feel positively about exploring new concepts and possibilities. However, emotions like insecure (13) and sceptical (12) signal early tensions and critical self-reflection as students begin to evaluate the feasibility and originality of their ideas.

Mid-frequency emotions include satisfied and thoughtful (11), content and foolish (10), pointing to a blend of confidence and reflection. Emotions such as playful, amazed, irritated, scared, and confused fall between (8) and (9) mentions. Meanwhile, negative emotions such as boredom, anxiety, and weakness appear with (7) mentions each, reflecting the beginning of disengagement.

Further down the list, mid-frequency emotions like acceptance, annoyance, apprehension, and delight show up around (6) times, followed by a mix of emotions such as energetic, admiration, sleepy, frustration, rejection, terror, and embarrassment (4) and (5) mentions. A tail of low-frequency emotions emerges next, including disappointed, mad, joy, miserable, ashamed, inferior, fascinated, and happy (2) and (3) mentions each. In contrast, emotions such as guilty, ecstasy, distracted, surprise, submissive, and nervous were each recorded only once.

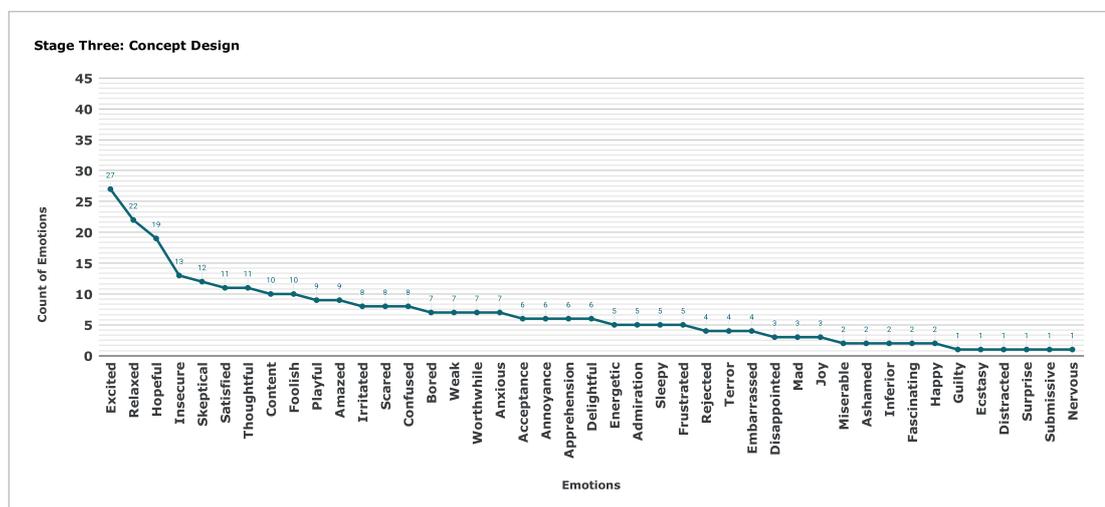


Figure 4-4. Design Process Stage Three: Concept Design Emotions Range.

#### 4.2.1.4 Design Process Stage Four: Design Development

Figure 4-5 presents emotions reported during stage four: design development. This phase transitions from conceptual exploration to a more refined design approach as students begin developing their design decisions and directions. A total of 42 distinct emotions were recorded during this stage, representing the second-highest emotional range after stage three.

The most frequently reported emotions are satisfied and thoughtful, each appearing 16 times. Hopeful and frustrated (11) mentions each. This is closely followed by mid-frequency emotions such as scared (9), relaxed, content, mad, and excited (8), indicating that while optimism remains, students are also navigating challenges and uncertainties during development. Emotions like boredom, sceptical, confusion, annoyance, weak, and irritation appear (7) times, reflecting moments of doubt or difficulty. Another tier of emotions, including delighted (6), apprehensive, sleepy, amazed, worthwhile, ecstasy, anxious, acceptance, and foolish ranges from (4) to (5) mentions, showing the emotional mixture.

As with other stages, a long tail of lower-frequency emotions appears, such as joy, embarrassment, fascination, insecurity, depression, energetic, shame, disappointment, miserable, destruction, playful, and admiration (2) to (3) mentions, pointing to moments of emotional discomfort. At the lowest end of the spectrum, emotions like inferior, rejected, submissive, anticipation, and disgust appear only once, suggesting a more individualised emotional experiences.

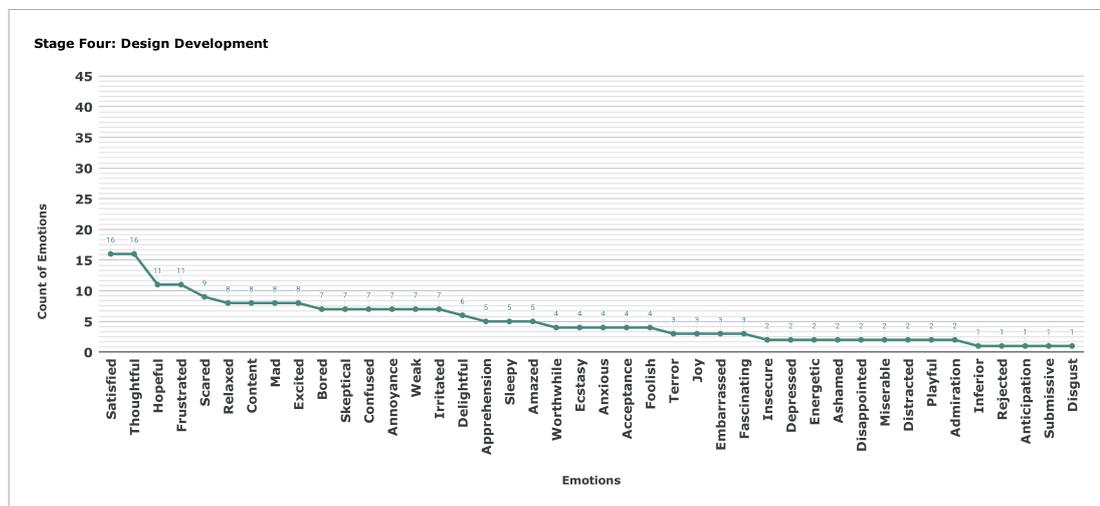


Figure 4-5. Design Process Stage Four: Design Development Emotions Range.

#### 4.2.1.5 Design Process Stage Five: Detail Design

Figure 4-6 illustrates the emotional mixture reported during stage five, the detailed design of the design process. This stage involves refining and finalising design solutions, often with increased technical and aesthetic focus. It has the lowest emotion range among the other stages, with 34 distinct emotions recorded in this phase, reflecting slightly more specified emotional experiences than earlier stages.

The most frequently reported emotion during this stage is satisfaction, with (26) mentions, indicating a sense of accomplishment as students see their designs take a more complete form. A significant drop into the next emotion was reported, with relaxed and content (14) and excited (13) recorded, suggesting that students feel a combination of fulfilment and continued comfort. The appearance of bored (12), irritated and frustrated (10) signals that, despite the progress made, some repetition aspects during certain design stages may lead to disengagement.

Mid- frequency range emotions such as hopeful, thoughtful, worthwhile, with (9) each, and amazed, playful, and energetic (7) each indicate ongoing positive emotional experiences. Meanwhile, expressions like annoyed, confused, and anxious (5) each suggest an interplay between emotional highs and lows, as well as fluctuations in energy levels, as students work through the detailed aspects of their designs. Followed by a long line of emotions including ecstasy, sleepy, sceptical, delightful, joy, admiration, and fascinating appear (4) times each, representing mixed responses. Another long tail of lower-frequency emotions follows, such as terror, scared, distracted, acceptance, mad, and foolish, (2) to (3) mentions each along with a few emotions recorded only once: weak, embarrassed, miserable, anticipation, and trust.

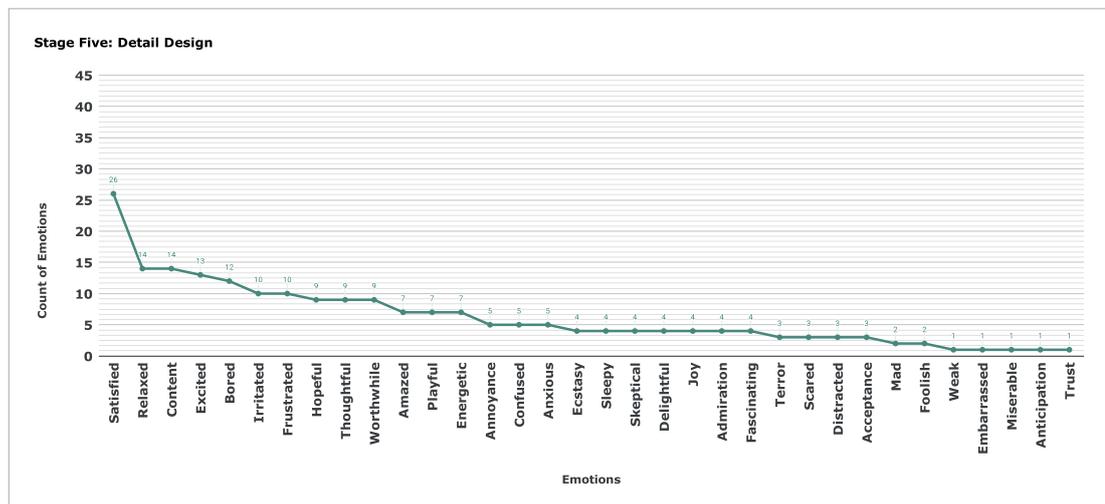


Figure 4-6. Design Process Stage Five: Detail Design Emotions Range.

#### 4.2.1.6 Design Process Stage Six: Production

Figure 4-7 illustrates the range of emotions reported during stage six: production, the final phase of the design process. This stage involves the realisation and delivery of the final design outcome, often marked by a combination of relief and final effort. A total of 37 distinct emotions were reported.

The most frequently reported emotion is relaxed, with (27) occurrences, suggesting a strong sense of pleasurable experiences as the project nears completion. This is followed by excited (17), highlighting that enthusiasm is present towards the final output. Other highly reported emotions include satisfaction (13), hope (12), and contentment (10), all indicating a positive sense of accomplishment and closure. The presence of anxious (8) and worthwhile (7) reflects a more introspective turn, possibly related to final evaluations or the pressure of submission and deadlines.

Mid-frequency emotions such as acceptance (6), apprehensive, energetic, thoughtful (5) each, and delightful (4) continue to show emotional variability as students reflect on the outcomes and impact of their design. On the other hand, low-frequency emotions like scared and terror (3) each, sceptical, ecstasy, playful, frustrated, and happy (2) each. The longest list of lower-frequency emotions appears at this stage with only (1) mention, including both positive and negative effects: depressed, sleepy, bored, better, submissive, anticipation, embarrassed, joy, annoyance, mad, stressed, amazed, weak, admiration, distraction, sadness, fear, and foolish. These emotions indicate individual emotional occurrences and responses tied to final refinement challenges, dynamics, or internal judgments about the final result on individual bases.

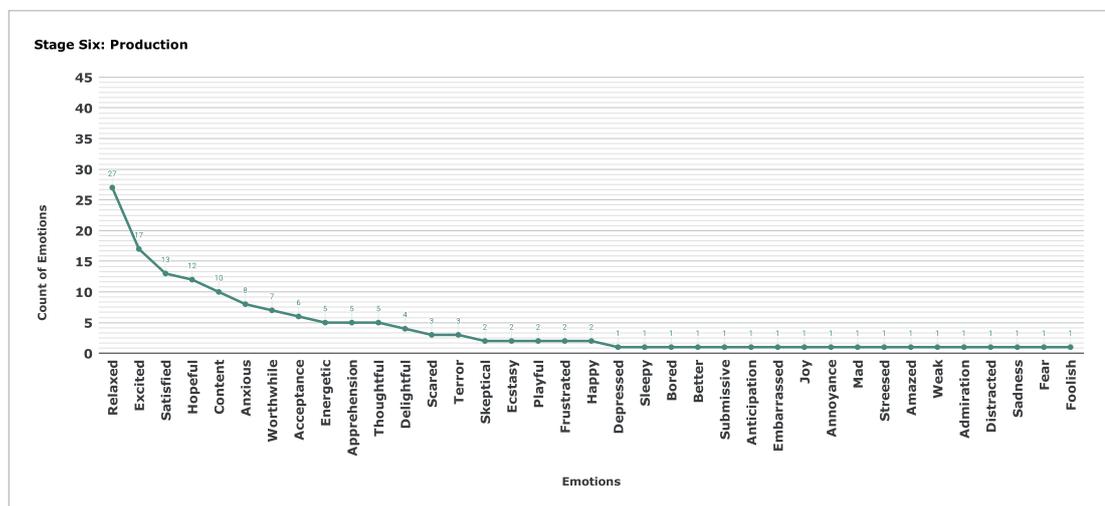


Figure 4-7. Design Process Stage Six: Production Emotions Range.

Notably, previous figures reveal that three positive emotions, which are excitement, relaxation, and satisfaction, overwhelmingly characterise students' emotional experiences throughout the design process. However, despite their relatively low frequencies, the three negative emotions of anxiety, frustration, and boredom consistently appeared among the most reported across multiple stages of the design process. Additionally, the data illustrates that students initially began with heightened emotions, which gradually decreased as the process unfolded, reaching its lowest point during the design development stage, and subsequently increased as they progressed towards the production stage.

## 4.2.2 Design Process Emotion Manifestation

In this section, the manifestation of emotion is explored based on two levels: the first level considers the general distribution of emotions across the design process, while the second level focuses specifically on academic emotions (see 2.4.2.1, pp.118).

### 4.2.2.1 Emotion Manifestation within the Design Process

Figure 4-8 illustrates the relationship between the 50 emotions that design students reported and the design process's various stages. These stages are:

1. Brief and Specification
2. Research
3. Concept Design
4. Design Development
5. Detail Design
6. Production

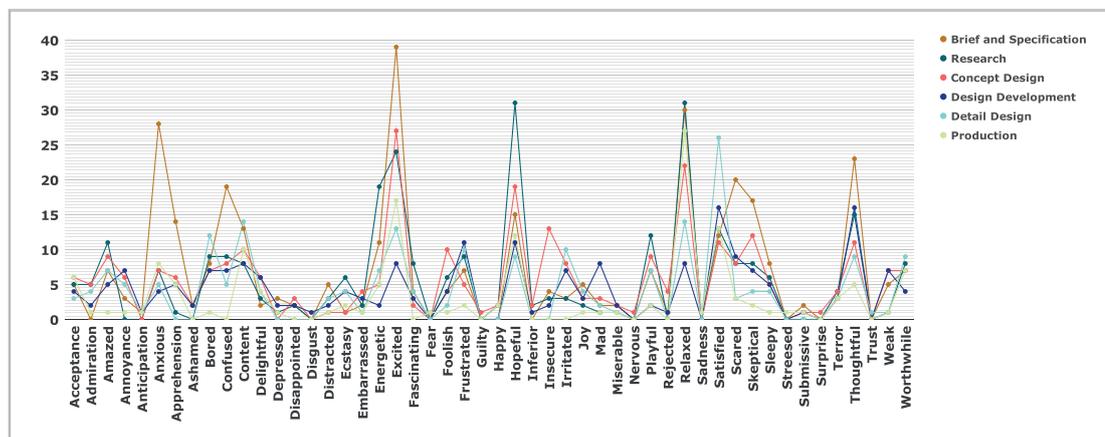


Figure 4-8. Emotional Experiences during Design Process Stages.

Generally, positive emotions are more prominent during the design process, with excitement and relaxation interchangeably being the highest during the first three stages. Thus, the differences between these emotional occurrences and the subsequent ones are quite significant. As the design process moves into its second half, the frequency and repetition of individual emotions generally increase compared to the earlier stages. Positive ambiguous

emotions such as satisfaction, hopefulness, thoughtfulness, and contentment begin to appear more prominently. In contrast, negative emotions are less consistently present throughout but tend to become more noticeable in the later stages. These include anxiety, fear, confusion, scepticism, boredom, and frustration, with frustration standing out in the final phases, potentially reflecting the increasing pressure and challenges of finalising and delivering the design outcome. Regarding positive emotions, the figure shows that students expressed a high level of excitement during the initial brief and specification stage, suggesting strong enthusiasm at the project's outset. In the research phase, relaxation was the most reported emotion, indicating a sense of ease or confidence while gathering information. Excitement resurfaced during the concept design stage, highlighting continued engagement. The design development stage recorded the highest satisfaction levels, likely as ideas became more concrete and progress was visible. This satisfaction continued into the detailed design stage as students refined their concepts. Finally, in the production phase, excitement peaked again, reflecting the anticipation and fulfilment of bringing the final design to life.

Moreover, the figure shows that anxiety is most prevalent during the first stage of the design process. In the second stage, frustration and boredom are the most frequently reported emotions. During the third stage, scepticism and insecurity were most frequently recorded. Once again, frustration stands out as the dominant negative emotion in the fourth stage. In the fifth stage, boredom was the most reported emotion, closely followed by irritation and frustration. Finally, in the last stage, anxiety re-emerged as the most commonly experienced emotion. Appropriately, Figure 4-9 illustrates a detailed comparison of the emotional manifestations between positive and negative emotions during the students' design process.

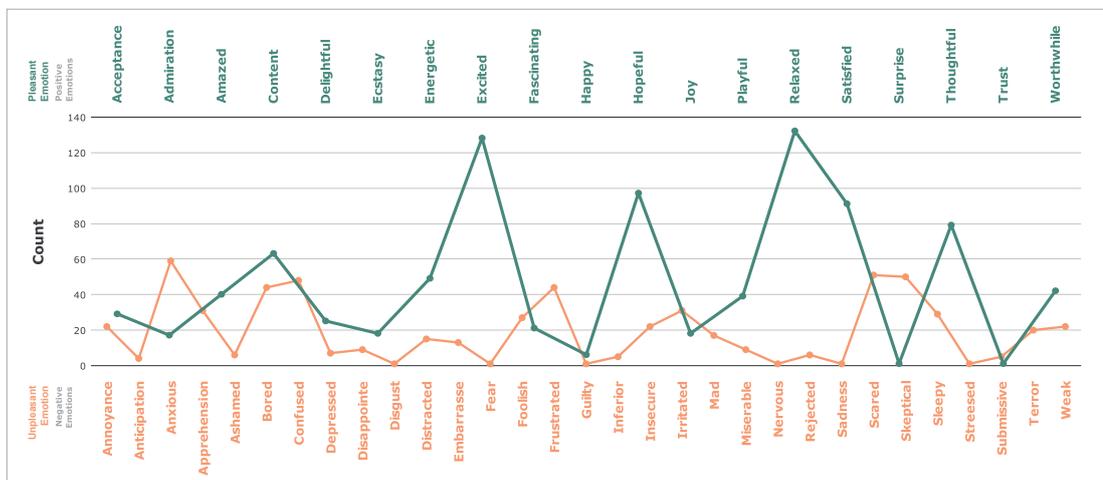


Figure 4-9. Positive and Negative Emotions Comparison.

Overall, positive emotions were reported more frequently than negative ones, suggesting a generally pleasant emotional experience. Notably, excitement stands out as the most frequently experienced emotion, followed by satisfied, relaxed, indicating that moments of enthusiasm and fulfilment are central to students' engagement. In contrast, negative emotions appeared less consistently but were still significant at certain points. Anxious and frustrated were the most prominent among negative emotions, suggesting moments of stress

and difficulty, potentially tied to uncertainty. While positive emotions peaked at specific moments, likely aligned with key phases such as brief, research, ideation or delivery, negative emotions were more spread out and appeared more obvious within the middle stages.

#### 4.2.2.2 Academic Emotion Manifestation within the Design Process

As previously mentioned and based on the framework presented by Pekrun et al. (2007) the analysis involves evaluating students' experiences by examining the intersection of emotion used within the EmotionProbe and the emotion specified in the framework. As a result, the analysis will encompass the following 10 emotions: enjoyment, joy, hope, relaxation, contentment, anger, frustration, anxiety, shame, boredom, sadness, and disappointment (see Table 2-3, 2.4.2.1, p.119).

First, Figure 4-10 exhibits how emotions manifest during the design process, revealing a pattern of being tuned to positive emotions reported by the students throughout the process. Relaxation is most prevalent during the brief and specification and research (opportunity identification) stages. However, anxiety is highest at the same stage as well. Hope tends to peak during the research stage. Content appears relatively stable across different stages. Boredom is highest during the detailed design and lowest during production. Frustration is highest during design development. Joy is relatively low but slightly higher at the start of the process. Shame and disappointment occur at very low frequencies.

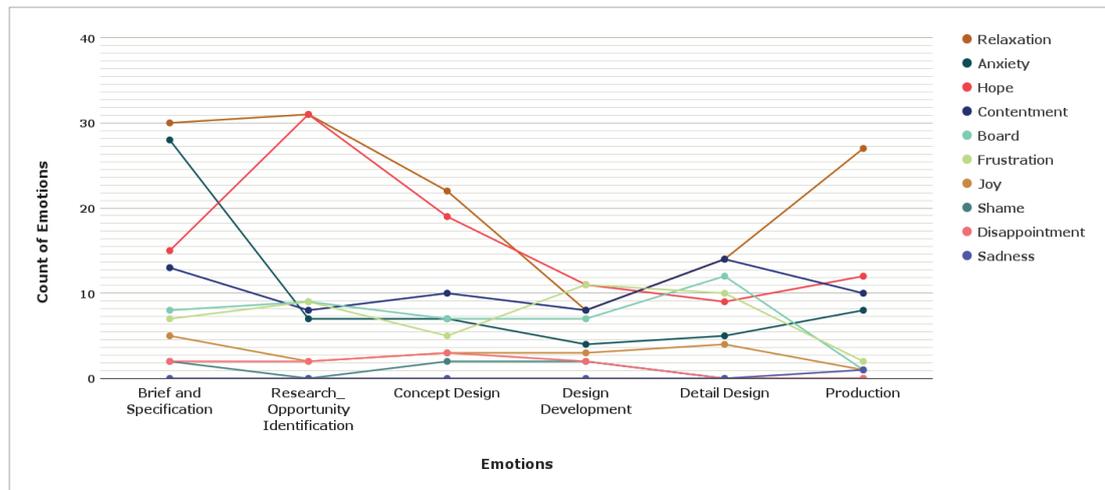


Figure 4-10. Academic Emotions Manifestation within the Design Process.

Moreover, the data in Figure 4-11 highlights a comparison of students' emotional experiences throughout various stages of the design process. Relaxation emerged as the most consistently reported emotion throughout, with a notable peak during the research stage, followed closely by hope, which also dominated during this phase. In contrast, anxiety was most prominent at the brief and specification stage, then dropped significantly in the following stages. Frustration and boredom started with low occurrences but gradually increased, peaking during the design development and detailed design stages, likely reflecting growing complexity and challenges. In the production stage, relaxation reached its highest level, while

negative emotions were either absent or at their lowest. Interestingly, sadness appeared only at the final production stage, although at a minimal level, indicating a rare but present emotional response at the end of the process.

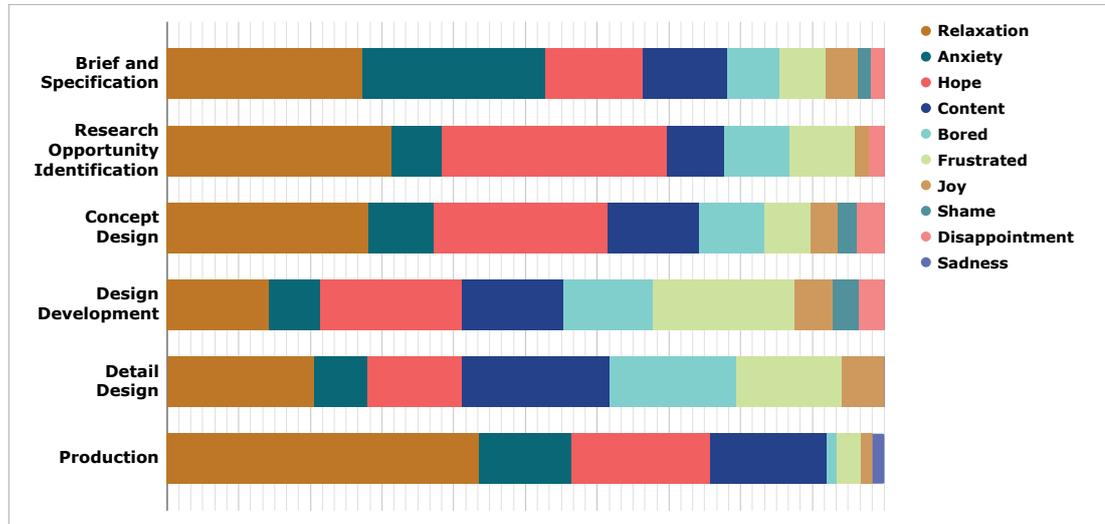


Figure 4-11. Design Process Stages and Emotion Recorded.

### 4.2.3 Design Process Emotional Experiences

Figure 4-12 presents a comparative analysis of emotional experiences reported by students in Scotland and Jordan. The emotional data is visualised using two pie charts, each representing the valence dimension of emotional experiences, which consist of pleasant (positive) and unpleasant (negative) emotions recorded in each student's group. Accordingly, the emotions two categories are: pleasant (relaxed, hopeful, content, and joy) and unpleasant (anxious, frustrated, bored, ashamed, disappointed, and sadness) (Pekrun et al., 2007).

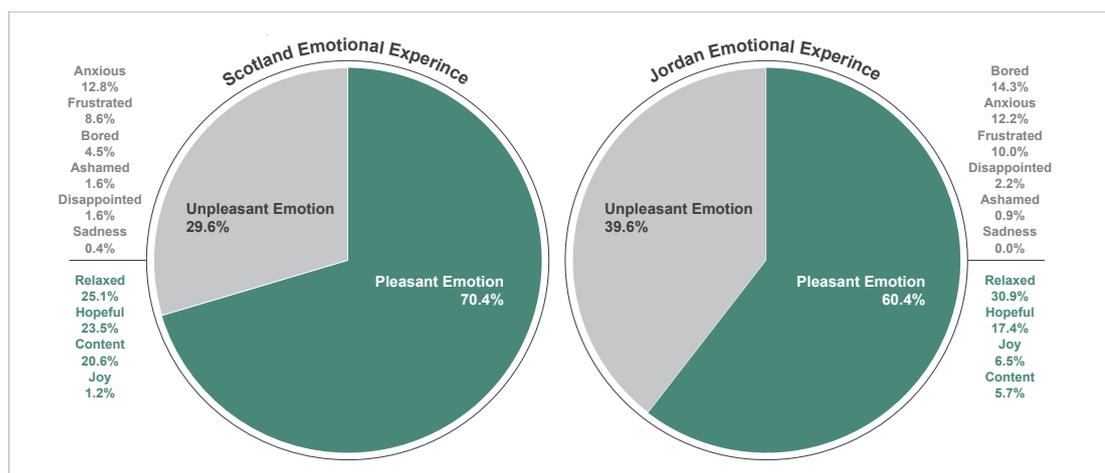


Figure 4-12. Pleasant and Unpleasant Emotional Experiences in Jordan and Scotland.

In the Scottish context, the emotional experience was predominantly positive, with 70.4% of responses falling into the positive emotion category. Among these, the most commonly

reported emotions were relaxed (25.1%), hopeful (23.5%), and content (20.6%), while joy appeared in (1.2%) of the responses. Negative emotions comprised (29.6%) of the total emotional responses, with anxiety (12.8%) being the most frequently mentioned followed by a lower percentage of frustration (8.6%). After that boredom (4.5%), and smaller proportions of shame (1.6%), disappointment and sadness (0.4%). This emotional percentages suggests that students in Scotland generally experienced a positive emotional experience, with a dominant sense of calm and forward-looking sentiment.

In contrast, students in Jordan reported a slightly less positive emotional experiences. Positive emotions accounted for (60.4%) of responses, while negative emotions were higher than Scotland, representing (39.6%) of the total. The most common positive emotion in Jordan was the same as Scotland by feeling relaxed (30.9%), followed by hope (17.4%), yet a difference in joy (6.5%), and contentment (5.7%) was reported. In contrast to the Scottish students Jordanian negative emotions showed a more even distribution across multiple categories, with boredom (14.3%), anxiety (12.2%), and frustration (10.0%) being the most prevalent. Disappointment (2.2%) and shame (0.9%) were also reported, but no students reported sadness.

Overall, the comparison indicates a slight difference in the distribution of the emotional experiences, with students in Scotland expressing a higher overall positivity than those in Jordan. While both contexts reported a majority of positive emotions, the emotional balance in Scotland was more decisively positive. In Jordan, the higher levels of boredom, anxiety, and frustration may reflect underlying cultural, social, or situational pressures, which could influence how individuals engage with their environments and, potentially, with their design educational practices. These findings may have significant implications for understanding emotional engagement in design and educational settings, especially considering how factors internal and external, such as local contexts, shape emotional expression and experiences.

Despite the slight differences noted above, and considering that the students come from distinct cultural and educational backgrounds, the emotional experiences reported by both groups reveals notable similarities. This study does not aim to compare the two groups, but rather to acknowledge that, despite their different backgrounds, both groups experienced a close emotional landscape. Feelings such as relaxation, hope, and frustration appeared across both settings, suggesting that design students, regardless of geographical or cultural differences, navigate similar emotional terrains in their learning environments. This shared emotional experience points to the universality of certain emotional responses within design education and underscores the importance of addressing emotional engagement as a core aspect of the educational experience across diverse design contexts.

Moreover, Figure 4-13 presents the emotional data by categorising emotions based on the arousal emotion dimension as either active (anxious, frustrated, hopeful, joy) or deactive (relaxed, content, bored, disappointed, sadness) as referred to the Three-Dimensional

Taxonomy of Achievement Emotions framework (Pekrun et al., 2007). While Figure 4-12 emphasises the valence of emotions (positive versus negative) Figure 4-13 visualisation introduces the arousal dimension by considering emotional activation levels, which offers insight into the energy and engagement linked to emotions.

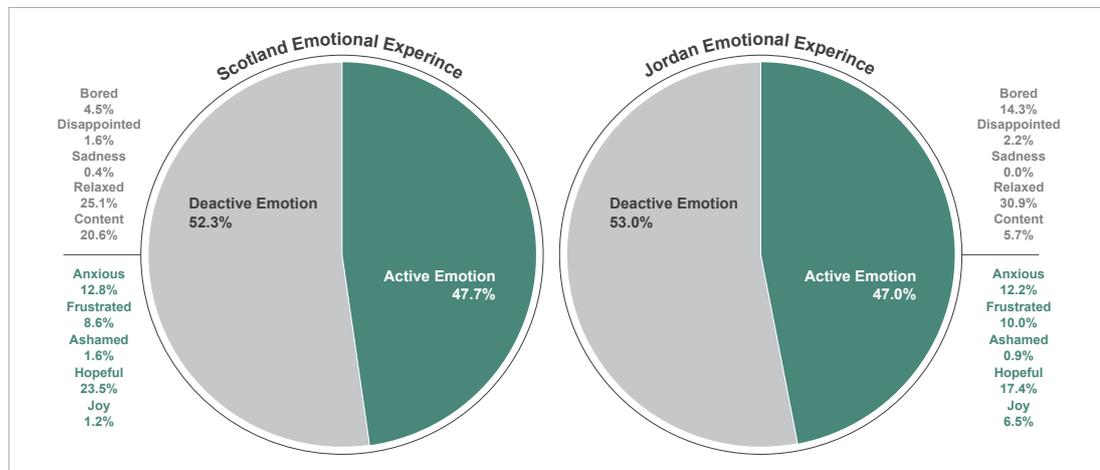


Figure 4-13. Activation and Deactivation of Emotional Experiences in Jordan and Scotland.

Strikingly, both Scotland and Jordan show a relatively balanced distribution between active and deactive emotional experiences, with deactive emotions slightly override active ones in both contexts. Despite cultural and educational differences, this consistent pattern suggests that design students across both settings tend to experience more emotionally energy-reducing experiences than activating ones. This aligns with the previous observation that relaxed was the most commonly reported emotion in both groups, which is considered as a deactive but positive experience.

However, the differences remain. The proportion of deactive emotions is marginally higher in Jordan, reflecting a more substantial presence of emotions like boredom and relaxation, which may suggest lower energy engagement or possible disengagement at times. In contrast, Scotland's emotional profile is more evenly split, with a slightly greater presence of active emotions such as hope and anxiety, potentially indicating a more emotionally dynamic experience in the learning environment.

Together, both figures show that while emotional tone (positive versus negative) varies between groups, the emotional intensity (active versus deactive) remains relatively consistent, hinting at a shared emotional rhythm in the experience of design students, regardless of cultural background. This consistency in activation levels may be especially important when designing interventions to support student engagement or emotional well-being across diverse educational contexts.

Furthermore, Figure 4-14 shows the frequency of various emotional experiences reported by students from Jordan and Scotland. Overall, the figure reveals that the two groups shared emotional trends and some contextual differences between them.

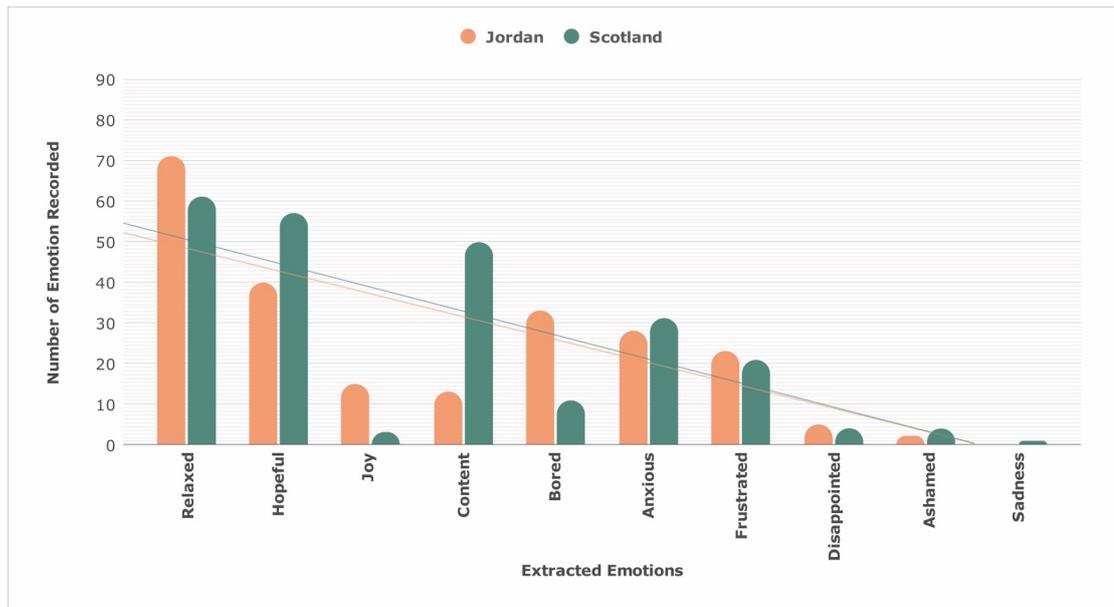


Figure 4-14. Extracted Emotions identified in the EmotionProbe exploratory study (Jordan and Scotland), Trend Line.

In terms of similarities, relaxed emerged as the most frequently reported emotion in both contexts, indicating a common emotional baseline among design students regardless of location. Additionally, emotions such as anxious, frustrated, disappointed, and ashamed, were present in both groups, though in varying quantities, highlighting that negative emotional experiences are a shared aspect of the design learning journey. Furthermore, both cohorts recorded relatively low frequencies for more intense negative emotions such as shame, disappointment, and sadness.

However, several differences are also noticeable. Students in Jordan reported higher instances of relaxed, joy, and bored compared to their Scottish counterparts, with boredom being significantly more prominent. This could reflect contextual or systemic differences in engagement levels or institutional learning environments. On the other hand, students in Scotland reported considerably more instances of hopeful and content than those in Jordan, suggesting a more ambiguous positively oriented outlook among the Scottish students. The difference in joy is also notable, with Jordanian students reporting this emotion much more frequently than those in Scotland, despite the higher levels of boredom in the same group.

Taken together, the chart reflects a shared emotional framework, with many of the same emotions appearing in both groups, while also revealing subtle yet meaningful distinctions in emotional emphasis. These insights highlight the interplay between individual emotional responses and broader contextual influences, reinforcing the value of understanding both commonality and difference when designing emotionally attuned educational experiences.

Another significant observation during the analysis was that, at certain stages, a few number of students did not record any emotions. This behaviour, although rare, was noticeable. When

asked informally during the second session, some students explained their lack of response by saying things like, "*I didn't feel anything toward this specific question*" or "*I don't know what emotion describes my state, it was just okay.*" Additionally, some students mentioned that they had not yet reached the stage the question was referring to, which made it difficult for them to respond meaningfully. While these instances were infrequent, they raise important questions about how students interpret the probe and how their engagement or progression through the design process affects emotional reporting. It would be valuable to monitor whether similar patterns emerge in the second study to determine if this is an isolated occurrence or a recurring behaviour that warrants further investigation.

#### 4.2.4 EmotionProbe Results Significance

The EmotionProbe revealed several significant findings about the emotional experiences of design students during their design process (Figure 4-15).

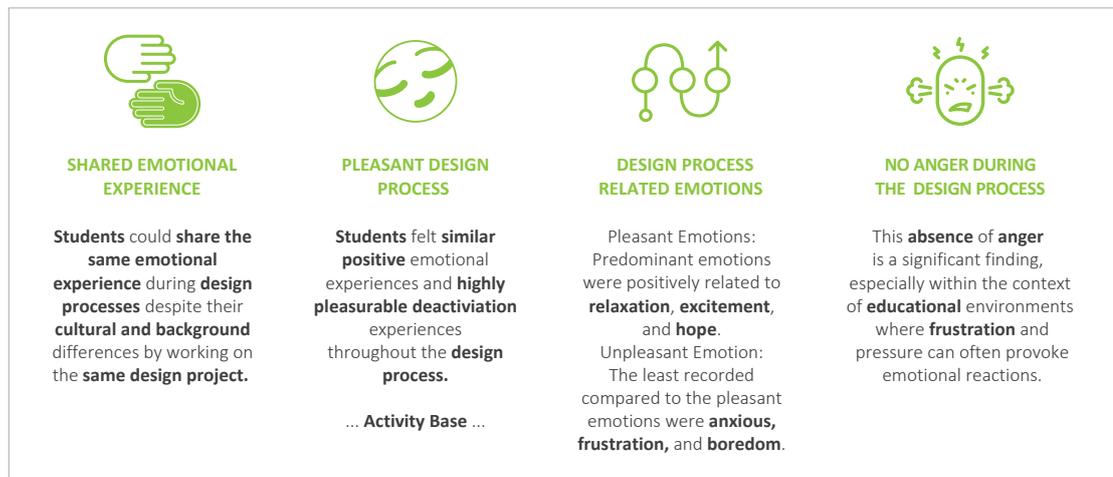


Figure 4-15 EmotionProbe Findings Highlights.

The most significant findings of the preliminary study are as follows:

- First, the demonstration of shared emotional experiences among students from different cultural and educational backgrounds. Despite contextual differences, students from both Jordan and Scotland reported experiencing similar emotional responses while engaging in the same design project. This highlights the EmotionProbe's capacity to bridge cultural divides by focusing on the emotional dimension of design learning, suggesting a universal emotional rhythm within design education.
- Second, a particularly noteworthy observation was the emergence of a pleasant emotional pattern across the design process. Students consistently expressed positive emotional experiences. In addition, the results revealed a relatively balanced emotional distribution along the activation and deactivation dimensions, though with a slight tendency toward deactivation of emotional experiences over activation ones. As highlighted in Marji et al. (2024), the design project directly influenced students' emotional experiences throughout the design process. The specific criteria and structure of the project shaped these experiences. Data gathered through the EmotionProbe clearly reflected and explained this impact (Marji et al., 2024b; Tang et al., 2021).

- Third, the EmotionProbe revealed that the emotions most closely related to the design process were relaxation, excitement, and hope. Students consistently expressed these emotions and appeared to align naturally with the rhythm and nature of the hands-on design activity. Their recurrence suggests students experienced the design process as motivating, engaging, and filled with possibility. On the other hand, emotions commonly associated with unpleasantness are anxiety, frustration, and boredom, even though they were reported far less frequently.
- Fourth, a noticeable gap emerged in the reporting of shame, with a significant difference between the number of students who recorded this emotion in Jordan compared to Scotland. This disparity may reflect cultural or contextual influences, where Jordanian students might be less inclined to express emotions like shame due to different conceptual or social understandings of emotional disclosure. The absence of sadness in the responses from Jordanian students was also notable. In contrast, this emotion appeared only in the responses of Scottish students and was reported specifically during the final stage of the project, the production phase.
- Fifth, most notably, anger was not recorded at all throughout the design process. This absence of anger is a significant finding, especially in educational environments where frustration and pressure can often provoke emotional reactions such as anger.

In conclusion, the EmotionProbe proved to be not only a reliable tool for tracking emotions in real time but also a valuable indicator of the emotional climate within design education. Its results support the notion that emotional experiences are not only central to the design process but also shared and consistent across diverse groups, reinforcing the importance of embedding emotional awareness and reflection into design pedagogy.

## Main Study Results

### 4.3 The Emotion Tracker Results

This section presents the results collected through the Emotion Tracker, the second cultural probe tool designed to explore more in-depth students' academic emotions related to the design process (see 3.3.1, pp.140). The tracker offers an overview of the emotional patterns observed throughout the one-year major design project conducted in Jordan and Scotland. The tracker aimed to capture real-time emotional responses, providing insights into the experiences, intensity, and frequency of emotions experienced. By analysing these results, we can better understand how emotional dynamics influenced design students' performances, progress, and decision-making, and identify key moments that may warrant further reflection or action. This tool aims to answer the following questions:

#### **RQ1. What emotional experiences do design students encounter throughout the design process?**

*RQ1.2. How do different emotions manifest in the students' design process?*

*RQ1.3. Are the students' emotional experiences pleasurable or otherwise?*

*RQ1.4. What are the dominant emotions experienced by design students?*

*RQ1.5. What significant emotional phenomena can be found in the design process?*

#### **RQ2. How do the design students' emotional experiences affect their design process?**

*RQ2.1. What are the relationships between students' emotions and their design process stages?*

*RQ2.2. How are emotions and design process stages distributed throughout the design process?*

#### **RQ3. How can the emotions of design students be effectively incorporated into their design process journey?**

*RQ3.1. What is the usability and reliability of emotion tracking tools during the design process?*

#### *4.3.1 Design Process: Emotional Experiences Manifestation*

Based on the tracker analysis from 41 design students, 29 emotions were identified; 13 were already part of the tracker, and 16 were new and added by students (Table 4-1). Stress, good, confidence, 'fine', and excitement were the highest among the other reported emotions. Although excitement was not included in the emotion tracker list in this study, several students mentioned it in their responses. This aligns with findings from a preliminary study, where excitement was reported as one of the most frequently experienced emotions during the design process. This emphasis by students suggests that excitement is strongly tied to the design process experiences and should be considered an emotion related to these experiences. Additionally, students frequently used the words 'fine,' 'good,' and 'okay', three

closely related but distinct words, indicating different emotional experiences they felt throughout the project.

Table 4-1. Other Emotions Added by Design Students during the Emotion Tracker Study.

| <b>Emotions</b> | <b>Frequency Count</b> |
|-----------------|------------------------|
| Stress          | 54                     |
| <b>Good</b>     | <b>28</b>              |
| Confident       | 24                     |
| <b>Fine</b>     | <b>18</b>              |
| Excitement      | 16                     |
| Enthusiastic    | 12                     |
| Happy           | 12                     |
| Overstimulated  | 12                     |
| Ambition        | 9                      |
| Overwhelmed     | 9                      |
| Exhaustion      | 7                      |
| Pride           | 6                      |
| Unsatisfied     | 5                      |
| interest        | 4                      |
| <b>Okay</b>     | <b>4</b>               |
| Uncertain       | 4                      |
| Useful          | 4                      |
| Fear            | 3                      |
| Satisfied       | 3                      |
| Scared          | 3                      |
| Crying          | 2                      |
| Validated       | 2                      |
| Worry           | 2                      |
| Better          | 1                      |
| Helpful         | 1                      |
| Regret          | 1                      |

All-inclusive, the newly added emotions form (2.8%) of the overall students' emotional experiences (Figure 4-16). The figure also displays the academic emotions experienced by design students throughout a one-year major design project. The outer ring presents a proportional breakdown of individual emotions, including the five activity emotions, eight achievement emotions, and other emerged emotions and states (see 3.4.2.3, pp.158). Meanwhile, the inner rings classify these emotions by valence (pleasant versus unpleasant) and arousal level (active versus inactive) (see 2.4.4, pp.122).

These percentages reflect both the average intensity of activity-related emotions and the proportional frequency of achievement-related emotions reported by students. The most frequently reported emotions were contentment (22.4%), anxiety (18.9%), hope (17.5%), followed by a significant drop in joy (10.8%). Excluding anxiety, the remaining three account for nearly 50% of the achievement-related emotional responses, indicating a strong prevalence of positive emotional experiences. In contrast, other emotions such as relief (4.2%), disappointment (4.9%), shame (3.6%), and sadness (1.9%) were reported significantly less frequently. Regarding the average intensity of activity-related emotions, positive emotions such as enjoyment (3.3%) and relaxation (2.2%) showed higher intensity scores. Among negative emotions, frustration recorded the highest intensity (2.7%), followed by boredom (2.0%). Notably, anger once again appeared as the least experienced emotion, reported by only 1.8%. Anger average intensity was rated at 1, which corresponds to the baseline of the Likert scale. According to students' feedback, a rating of 1 was interpreted as minimal or even zero intensity. In fact, some students explicitly marked anger as 0, further underscoring anger lack of relevance in their experience. Overall, whether based on intensity or frequency, the data indicates that negative emotions were generally less prominent throughout the activity.

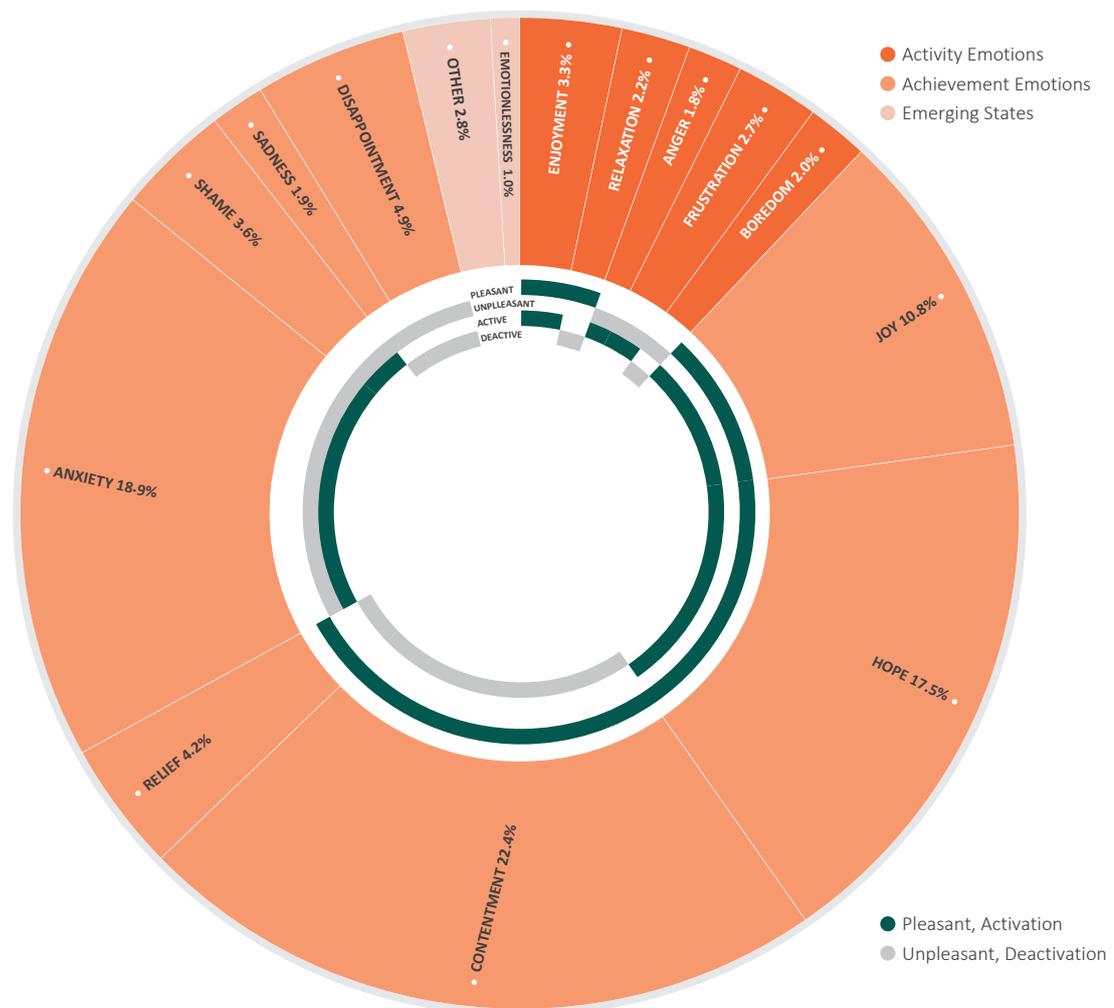


Figure 4-16. Design Students' Emotional Experiences during the Design Process, Emotion Tracker Study.

Moreover, the 'other' emotions listed in Table 4-1 account for (2.8%) of the overall emotional experiences. It is worth noting the frequent appearance of the word 'fine' as an emotion, which was used by a considerable number of students. Additionally, students reported neutrality or feeling nothing, and we name this phenomenon 'Emotionlessness', representing 1.0% of the total emotional responses. Hence, a description of the newly emerged term and emotional state will be discussed in detail later (see 4.4.4, pp.262).

Further, the inner categorisation of Figure 4-16 classifies the emotional experiences into two dimensions: pleasant versus unpleasant and active versus deactive emotions. The green colour represents pleasant and active emotions, while the grey colour represents unpleasant and deactive emotions. The visualisation reveals that pleasant emotions were predominant throughout the design process, with a significantly higher proportion than unpleasant emotions. Additionally, the activation level of emotions was higher than deactivation, meaning students more frequently experienced emotions associated with higher energy. In contrast, deactive and unpleasant emotions accounted for a smaller portion of the total emotional experiences. This comparison highlights that the overall emotional landscape during the project was characterised by positive and active emotions.

Figure 4-17 summarise and give a detailed overview the emotions percentage based on the two dimensions: pleasant versus unpleasant emotions and activation versus deactivation emotions.

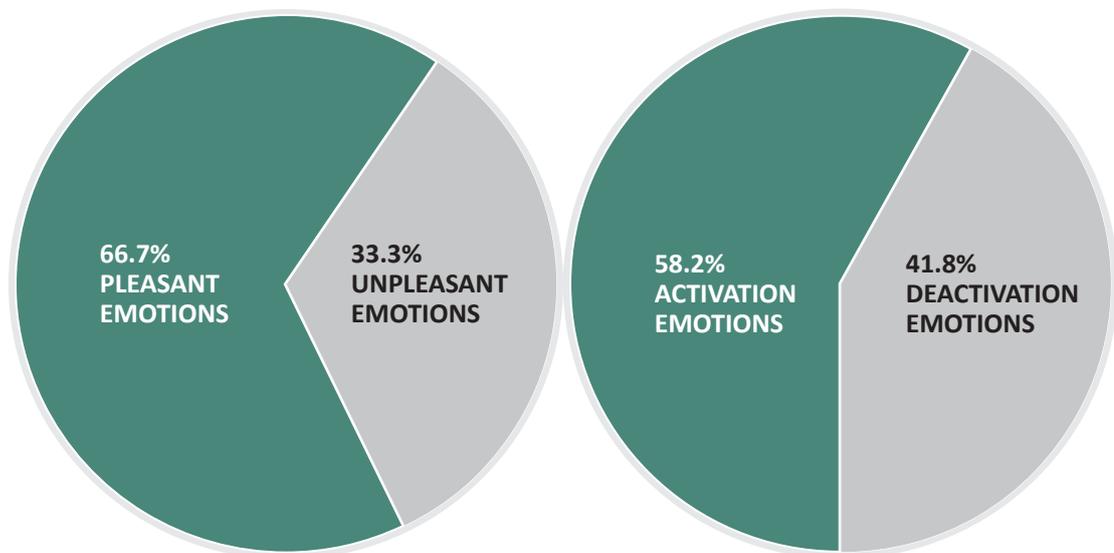


Figure 4-17. Students' Emotional Experiences Based on Valence and Arousal Dimensions.

The first chart on the left shows pleasant and unpleasant emotions. Pleasant emotions include enjoyment, relaxation, joy, hope, contentment, and relief, which together account for (66.7%) of the total emotional experiences, while unpleasant emotions, including anger, frustration, boredom, anxiety, shame, sadness, and disappointment, make up (33.3%). This

indicates that the emotional experience during the design process was predominantly positive, with students reporting pleasant emotions twice as often as unpleasant ones. The second chart on the right illustrates the distribution between activation and deactivation emotions. Activation emotions, which are higher in the energy level, include enjoyment, anger, frustration, joy, hope, anxiety, and shame, represent (58.2%) of the total, whereas deactivation emotions, associated with a lower energy level, including relaxation, boredom, contentment, disappointment, account for (41.8%). This shows that, overall, students experienced higher active emotions compared to deactive, subdued ones during the design process. Despite these insights, it is worth mentioning that the highest reported pleasant emotion, contentment, is classified as a deactive emotion, while the highest reported unpleasant emotion, anxiety, is classified as an active emotion.

### 4.3.2 Design Process: Activity Emotion Manifestation

Figure 4-18 presents the average intensity of six emotions, enjoyment, relaxation, anger, frustration, boredom, and other, which 41 students reported over a 30-week period. Each horizontal bar represents one week, with emotions differentiated by colour. Data analysis shows that enjoyment was consistently the most prominent emotion across the year, while anger remained relatively low on average. Focusing on the peak weeks for each emotion, the highest levels of enjoyment were in weeks 1, 2, 24, 22, and 4, indicating strong positive feelings at the beginning of the academic year and a resurgence later on. Relaxation followed a similar pattern, peaking in weeks 1, 2, 3, 4, and 11, suggesting a sense of comfort early in the project.

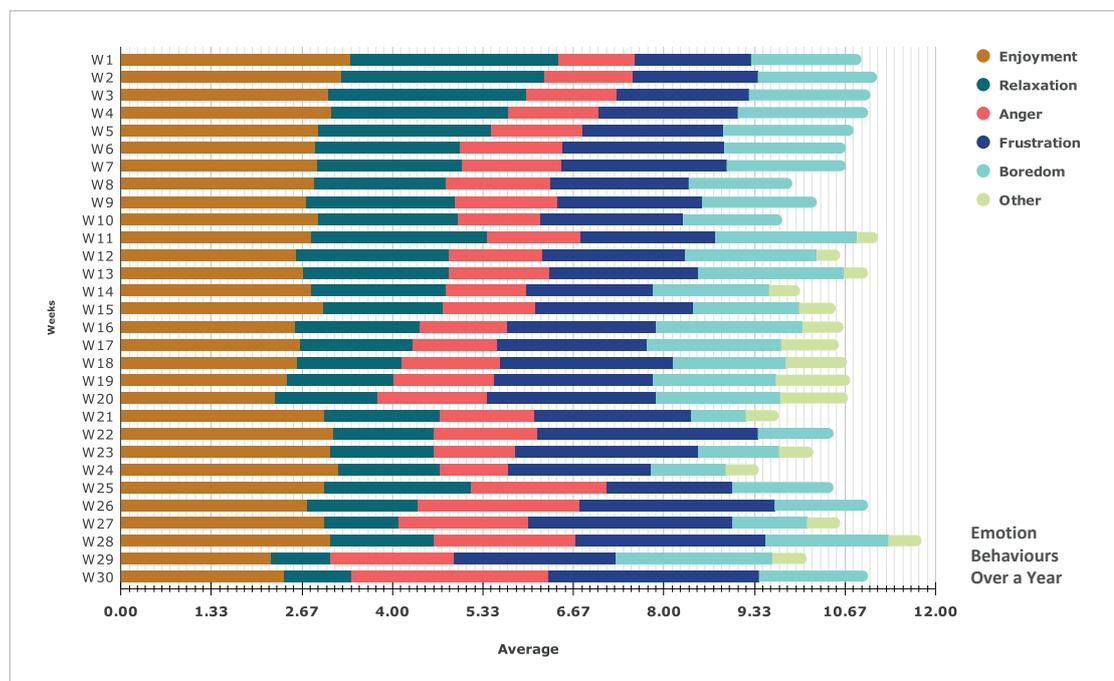


Figure 4-18. Emotional Behaviours over a year.

In contrast, anger with the least frequently observed towards the end, reaching its highest levels in weeks 30, 26, 28, 25, and 27, likely reflecting increased stress associated with final deadlines and project submissions. Frustration also peaked during the later stages, particularly in weeks 22, 30, 27, and 26, coinciding with periods of heightened academic pressure. Boredom, on the other hand, was more discontinuous, with peaks occurring in weeks 29, 16, 13, 11, and 17, suggesting moments of disengagement during the middle and later phases of the course. Overall, while students experienced more episodes of frustration at the end, and boredom in between, the dominant emotional trend throughout the year remained positive, characterised by sustained levels of enjoyment.

The emotional behaviour over the year can be summarised as follows:

- The highest weeks for Enjoyment were W1, W2, W24, W22, and W4.
- The highest weeks for Relaxation were W1, W2, W3, W4, and W11.
- The highest weeks for Anger were W30, W26, W28, W25, and W27.
- The highest weeks for Frustration were W22, W30, W27, W26, and W27.
- The highest weeks for Boredom were W29, W16, W13, W11, and W17.

Moreover, Figure 4-19 illustrates the number of students engaged in each stage of the design process, brief and specification, research, concept design, design development, detail design, production, and periods of no work across a 30-week period. Each horizontal bar represents one week and shows how many students were active in each stage, with distinct colours corresponding to the different phases. Analysis of the data shows that the initial stages of the project commanded the highest levels of engagement. Specifically, the weeks with the most student activity in brief & specification were weeks 1, 2, 5, 3, and 4, while research was most intensive during weeks 3, 4, 5, 6, and 7. Engagement with concept design peaked in weeks 10, 9, 12, 8, and 13, followed by a transition to design development, which saw the highest participation during weeks 14, 15, 13, 16, and 19. Later stages, such as detailed design, were most active in weeks 19, 20, 18, 17, and 27, and production peaked in weeks 20, 30, 19, 29, and 28. Periods of No Work were observed most frequently in weeks 9, 10, 11, 8, and 16.

Overall, the figure reveals that students dedicated significantly more time and effort to the early stages of the project, particularly the research phase. However, a noticeable decline in participation occurred during the detail design and production stages, suggesting possible challenges in sustaining engagement through the later, more technical phases of the design process.

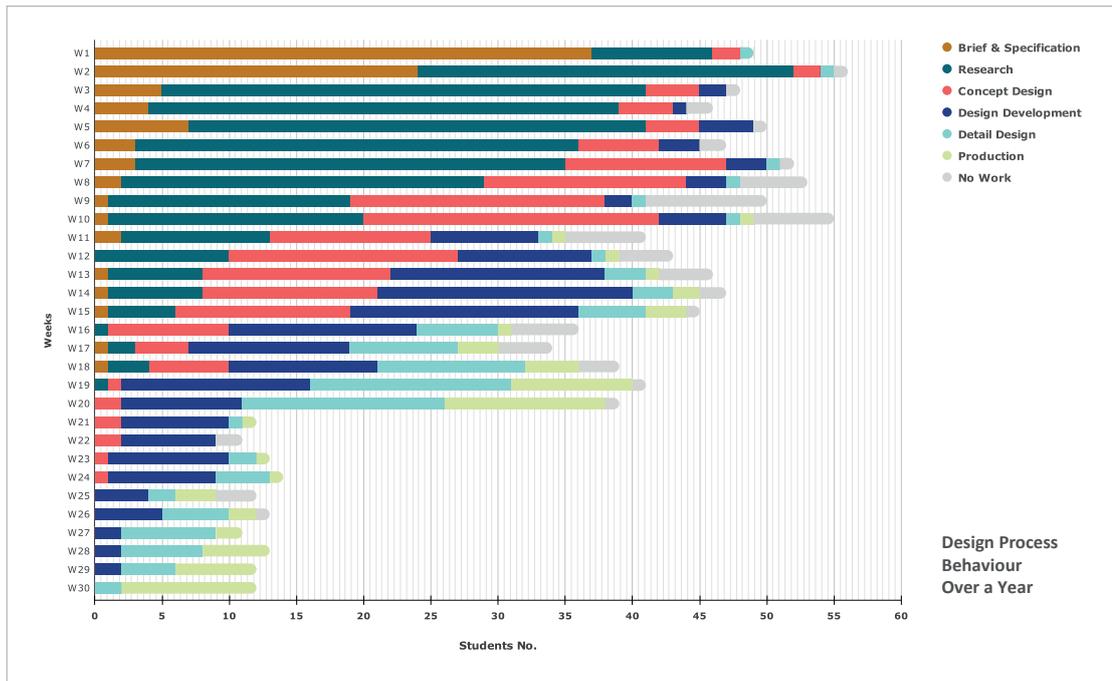


Figure 4-19. Design Process Distributions over a year.

The design process stages distributions over the year, can be summarised as follows:

- The highest weeks for Brief & Specification were W1, W2, W5, W3, and W4.
- The highest weeks for Research were W3, W4, W5, W6, and W7.
- The highest weeks for Concept Design were W10, W9, W12, W8, and W13.
- The highest weeks for Design Development were W14, W15, W13, W16, and W19.
- The highest weeks for Detail Design were W19, W20, W18, W17, and W27.
- The highest weeks for Production were W20, W30, W19, W29, and W28.
- The highest weeks for No Work were W9, W10, W11, W8, and W16.

#### 4.3.2.1 Design Process Activity Emotion Students' Engagement Lines

The line graph in Figure 4-20 illustrates the overall trend in student engagement across different stages of the design process during one year. The trend begins with a relatively low number of students engaged in the brief & specification stage, followed by a sharp increase during the research phase, where student involvement peaked. After this high point, there is a noticeable decline as students move into concept design, with a slight stabilisation during the design development stage. However, following this period, the trend shows a continuous and significant decrease through the detailed design and production stages, reaching the lowest levels at no work. This pattern indicates that while students were highly engaged during the early exploratory and ideation stages, their involvement steadily dropped as the design process became more detailed, technical, and production-oriented. The decline suggests potential challenges in maintaining motivation or managing workload as projects progress toward completion.

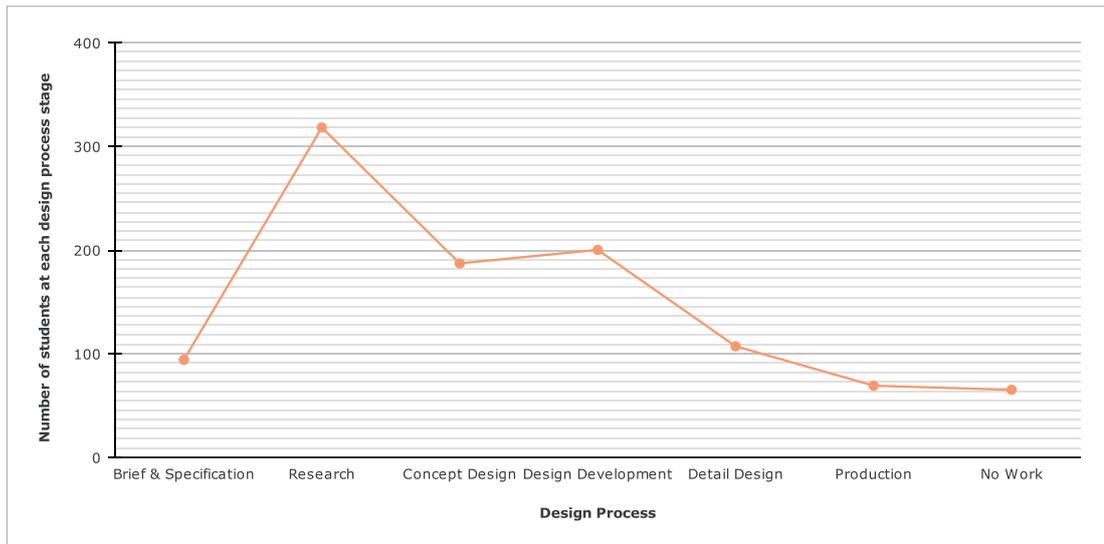


Figure 4-20. Student Engagement Across Design Process Stages.

While the line graph in Figure 4-21 illustrates the average intensity of emotions experienced by students during their activities, focusing on six activity emotions: enjoyment, relaxation, anger, frustration, boredom, and other emotions. The trend begins with enjoyment showing the highest average intensity, indicating that students generally felt positive and engaged throughout their activities. This is followed by a noticeable decline as relaxation and anger are reported at lower average intensities. Notably, there is a rise at frustration, suggesting that students encountered challenges that elicited stronger emotional responses. After this peak, the trend again declines through boredom. Overall, the trend reveals that positive emotions, particularly enjoyment, were more dominant compared to negative emotions such as anger, boredom, or frustration, although moments of frustration recorded a high intensity on average.

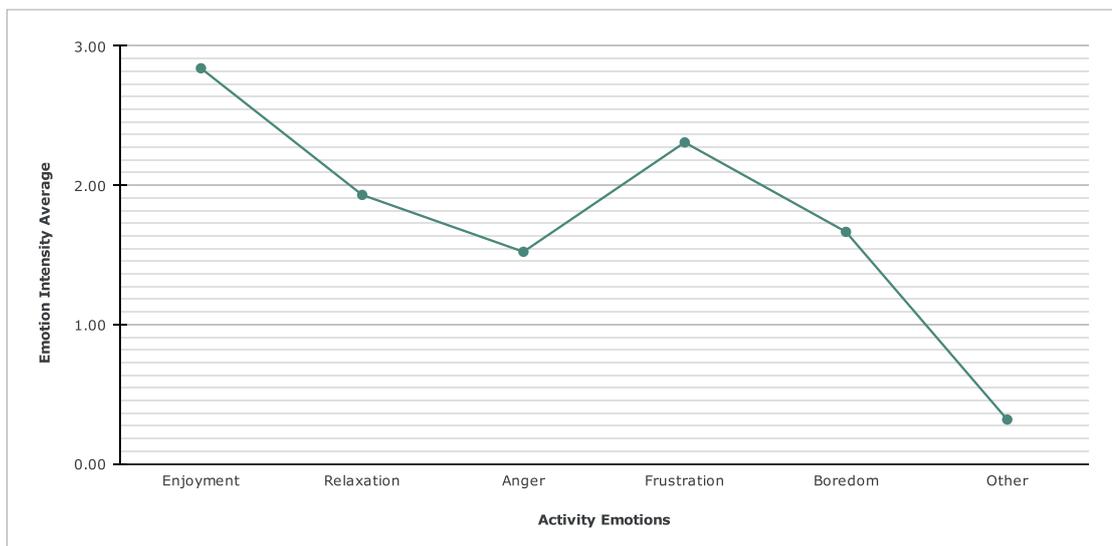


Figure 4-21. Average Levels of Emotional Engagement During the Design Process Activity.

#### 4.3.2.2 Design Process Activity Emotion Country Manifestation

As mentioned before, the research does not aim to compare the two participating groups from Jordan and Scotland in a competitive or evaluative manner. Rather, the intention is to explore and understand each group's engagement with the design process individually, highlighting differences and similarities in their experiences. By analysing each group's emotional patterns, the study provides valuable insights into how students from different educational and cultural contexts approach the design activities. This approach allows for a richer understanding of how design processes are navigated across settings, without positioning one group as a benchmark for the other. It is worth noting, as previously mentioned, that the project timelines differed between the two groups. Jordanian students had 30 weeks based on their academic calendar, while Scottish students had 20 weeks. This difference was taken into account and is addressed in the subsequent analysis.

First, Figure 4-22 illustrates the weekly distribution of student engagement across various stages of the design process among the Jordanian group over a 30-week period. Each bar represents one week, segmented by colour to indicate the number of students working in different phases. Data analysis reveals that the early weeks were dominated by activities related to brief and specification and research, particularly in weeks 1, 2, 3, 4, 5, and 7. This suggests that students focused heavily on defining the project scope and conducting foundational investigations. Concept design was most active in weeks 3, 4, 5, 14, and 15, marking a transition from initial planning to exploration. Engagement in design development peaked during weeks 19, 20, 21, 23, and 24, indicating a shift toward refining and detailing concepts. Detail design activity rose in the later weeks, with a high concentration in weeks 24, 26, 27, 28, and 29, followed by increased production work in weeks 15, 25, 28, 29, and reaching its peak in week 30. Periods of inactivity or 'no work' were notably observed in weeks 8, 9, 10, 11, and 16.

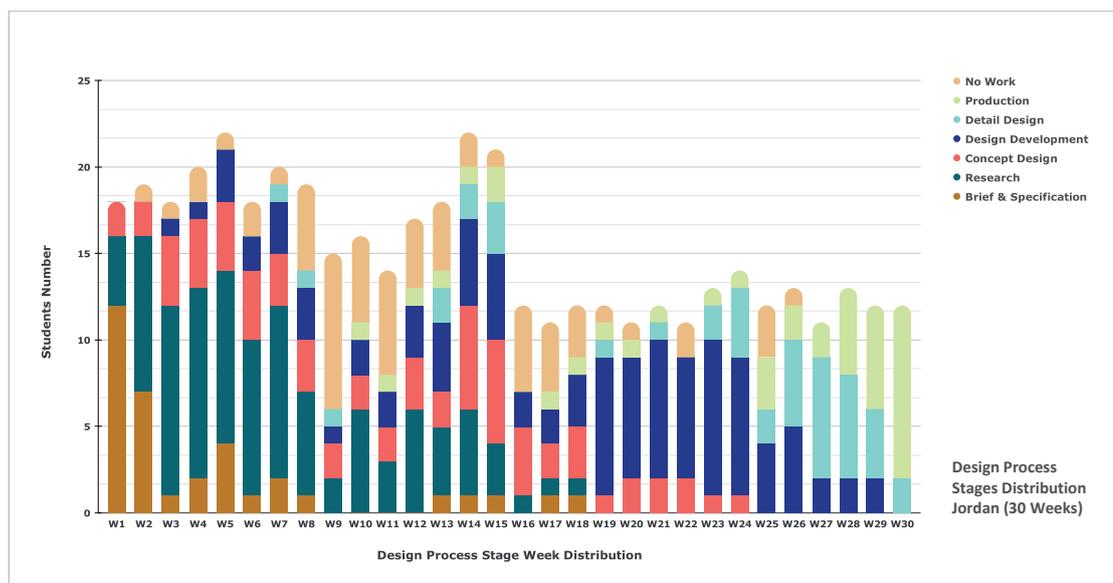


Figure 4-22. Weekly Distribution of Design Process Stages among Jordanian Design Students during the 30-Week Timeline.

On the other hand, Figure 4-23 presents the weekly distribution of student engagement across different design process stages for the Scottish group over a 20-week period. The figure shows that the early weeks 1 to 5 were primarily focused on brief and specification and research as well, with the highest levels of participation in these phases occurring during weeks 1, 2, 3, 4, and 5. This was followed by an intensive engagement in concept design, peaking in weeks 8, 9, 10, 12, and 13, indicating a clear shift toward ideation and creative development. Design development gained momentum in the middle of the timeline, especially in weeks 13 through 17. The transition into detail design and production was concentrated in the final weeks, with weeks 16, 17, 18, 19, and 20 showing the highest activity in these technical stages. Notably, week 10 stands out with a significant instance of 'no work', suggesting a possible break or drop in engagement. Overall, the figure illustrates a structured and sequential progression through the design process, from early-stage planning and research to final production, reflecting the flow of project development within the Scottish group.

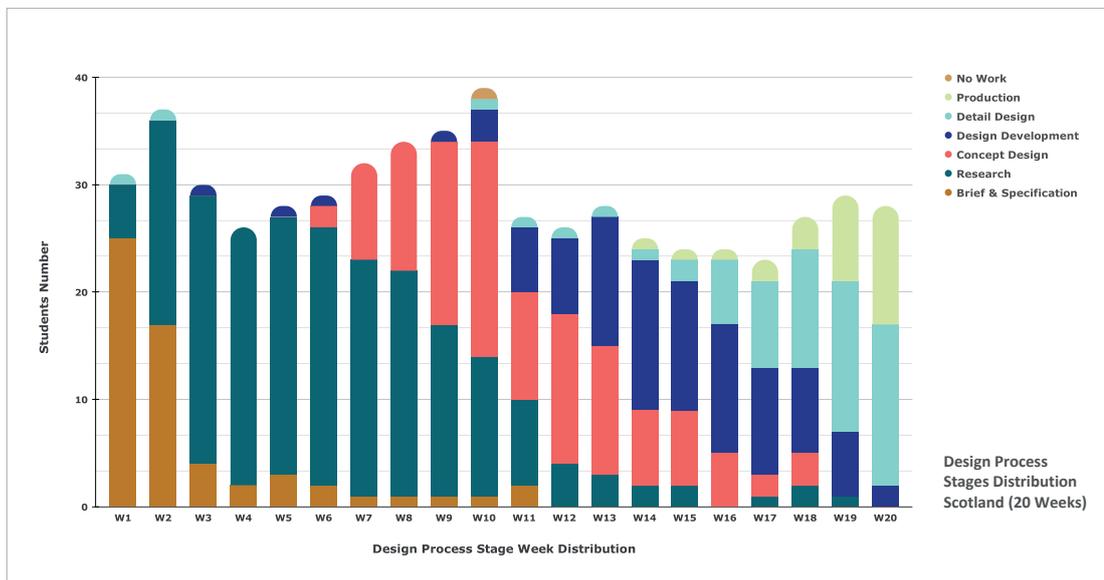


Figure 4-23. Weekly Distribution of Design Process Stages among Scottish Design Students during the 20-Week Timeline.

Table 4-2 summarises the most intensive design process stages in relation to the weeks for the Scottish and Jordanian student groups.

*Table 4-2. Most Intensive Stages of the Design Process According to the Week for Scottish and Jordanian Students.*

| <b>Design Stage</b>   | <b>Scottish Group (20 Weeks)</b> | <b>Jordanian Group (30 Weeks)</b> |
|-----------------------|----------------------------------|-----------------------------------|
| Brief & Specification | W1, W2, W3, W5, W4               | W1, W2, W5, W4, W7                |
| Research              | W3, W4, W5, W6, W7               | W3, W4, W5, W7, W2                |
| Concept Design        | W10, W9, W12, W8, W13            | W14, W15, W3, W4, W5              |
| Design Development    | W14, W13, W15, W16, W17          | W23, W19, W21, W24, W20           |
| Detail Design         | W20, W19, W18, W17, W16          | W27, W28, W26, W24, W29           |
| Production            | W20, W19, W18, W17, W14          | W30, W29, W28, W25, W15           |
| No Work               | W10                              | W9, W11, W8, W10, W16             |

Based on the data presented in Table 4-2, several similarities can be observed between the Scottish and Jordanian groups. First, both groups demonstrated an early focus on brief and specification and research, with high levels of engagement during the initial weeks of their respective timelines. This suggests a shared emphasis on establishing a strong foundation at the beginning of the design process. Notably, both groups showed peak activity in research during weeks 3, 4, 5, and 7, and in brief and specification during weeks 1, 2, 4, and 5. Second, both groups showed a similar pattern of progression toward concept design following the research phase, indicating a comparable design structure in which ideation emerges after exploratory work. Finally, there was a shared late-stage focus on detailed design and production, as both groups became more engaged in these stages toward the end of their project timelines. This highlights students' development process culminating in final outputs.

In contrast, clear differences are also evident, particularly in the timeline length and distribution of engagement across the stages. The Jordanian group, operating over a longer 30-week period, experienced more delayed transitions between stages, potentially due to the extended timeline. Additionally, the Jordanian group reported several weeks of no activity (weeks 8–11 and 16), reflecting more intermittent engagement and possible disruptions. In comparison, the Scottish group reported 'no work' in only a single week (Week 10), suggesting a more continuous and evenly paced workflow. Despite this clear difference, overall, both groups worked fully within a 19-week period with consistent engagement and participation across the design process, indicating a comparable commitment to developing their projects. Moving on to the emotional experiences reported by both groups, the analysis explores how students engaged emotionally throughout the design process, highlighting patterns of intensity and variation across different weeks. The upcoming figures visualise how the six activity emotions (see 3.4.2.3, pp.158): enjoyment, relaxation, anger, frustration, boredom, and other were experienced over time by each student group.

Accordingly, Figure 4-24 presents the average emotional intensity experienced by the Jordanian group across a 30-week period. The data shows that enjoyment was consistently the most dominant emotion, peaking in weeks 1, 2, 3, 4, and 15, suggesting a strong sense of motivation and positive engagement at the beginning of the design process and during a later creative phase. Similarly, relaxation was most intense in the early weeks 1 to 5, indicating initial comfort and confidence as students began their projects. In contrast, anger spiked during Weeks 9, 13, 26, 28, and 30, reflecting emotional strain toward the middle and especially at the end of the timeline, likely tied to workload pressures and deadlines. Frustration followed a similar pattern, with peaks in weeks 7, 18, 22, 27, and 30, reinforcing the idea of rising stress as students progressed through more demanding design stages. Boredom was most evident in weeks 4, 5, 13, 16, and 29, pointing to intermittent phases of disengagement or stagnation. Lastly, the 'other' category, representing less frequent or undefined emotions, peaked modestly in weeks 19, 20, 21, 23, and 24, suggesting minor emotional fluctuations during that middle segment of the project. Overall, the emotional experiences show a shift from early enthusiasm and relaxation to rising tension, frustration, and emotional variability and fluctuation as the project advanced toward completion.

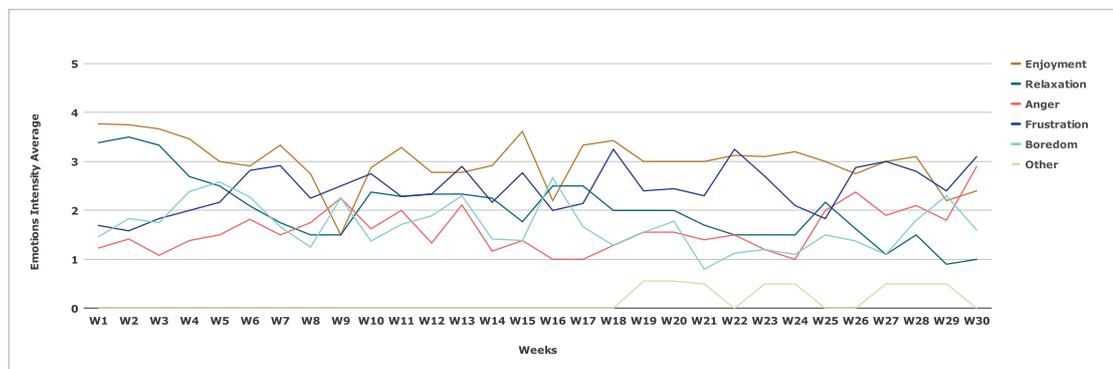


Figure 4-24. Average Intensity of Six Emotions Across 30 Weeks – Jordanian Students.

Additionally, Figure 4-25 illustrates the weekly average intensity of emotions experienced by the Scottish group over a 20-week period. The data reveals that enjoyment was the most consistently high emotion, especially in weeks 1, 2, 4, 9, and 10, indicating a strong initial sense of engagement and satisfaction with the design process. Similarly, relaxation peaked during the early weeks 1 to 4 and 11, suggesting that students began the course feeling comfortable and at ease. In contrast, anger showed a gradual increase toward the end of the project, with its highest intensities recorded in weeks 3, 8, 18, 19, and 20, likely reflecting rising stress or pressure associated with final deadlines. Frustration followed a similar late-stage trajectory, peaking in weeks 16 to 20, further reinforcing the emotional toll of progressing through more complex or demanding tasks. Boredom appeared most intensely in the mid-phase in weeks 11 to 13, 16, and 17, potentially indicating a temporary dip in engagement or task variety. Lastly, the 'other' emotion category increased steadily toward the final weeks, peaking in weeks 15, 17, 18, 19, and 20, which may suggest the emergence of mixed or ambiguous emotional responses as the project neared completion. Overall, the Scottish group exhibited a stable emotional journey, with early positivity gradually giving way to a more complex mix of emotions in later stages.

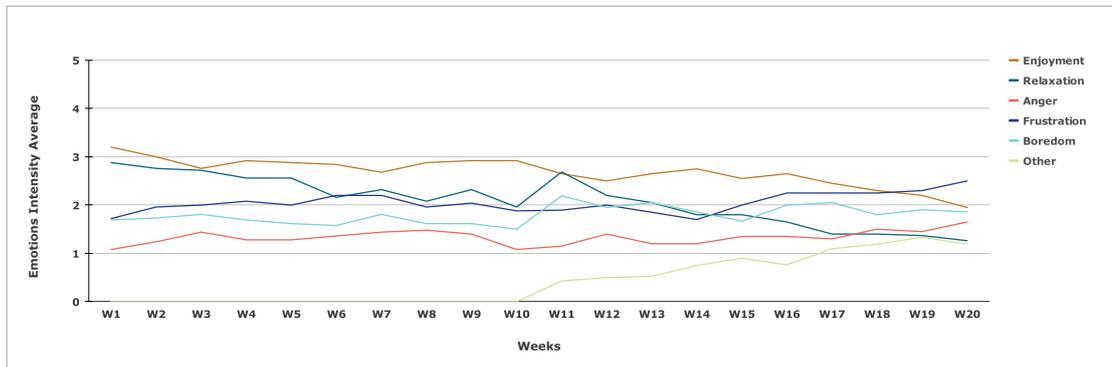


Figure 4-25. Average Intensity of Six Emotions Across 20 Weeks – Scottish Students.

However, the similarities and differences in the emotional experiences previously presented can be captured and summarised, as shown in Table 4-3. On one hand, a key similarity lies in the early emergence of positive emotions, where both groups reported their highest levels of enjoyment and relaxation during the initial weeks of the timeline. Specifically, enjoyment peaked at weeks 1, 2, 3, and 4, while relaxation was also highest between weeks 1 and 5 for both groups. This indicates a shared emotional experience of comfort and engagement at the start of the design process. Another significant commonality is the intensification of frustration toward the end of the timeline. For the Scottish group, frustration peaked between weeks 16 and 20, whereas the Jordanian group experienced its highest levels during weeks 22, 27, and 30. This pattern suggests that increased workload or approaching deadlines may have contributed to heightened emotional strain in both contexts. Additionally, both groups experienced boredom in the mid to late phases of the project, weeks 11 to 17 for the Scottish group, and weeks 4, 5, 13, 16, and 29 for the Jordanian group, indicating moments of disengagement, growing challenges, or task repetition. Finally, a rise in 'other' emotional responses was observed toward the end of both timelines, suggesting the presence of complex or mixed emotional experiences as students approached the conclusion of their projects.

Table 4-3. Most Intense Emotions According to the Week for Scottish and Jordanian Students.

| Emotion     | Scottish Group (20 Weeks) | Jordanian Group (30 Weeks) |
|-------------|---------------------------|----------------------------|
| Enjoyment   | W1, W2, W4, W9, W10       | W1, W2, W3, W15, W4        |
| Relaxation  | W1, W2, W3, W11, W4       | W2, W1, W3, W4, W5         |
| Anger       | W20, W18, W8, W19, W3     | W30, W26, W9, W13, W28     |
| Frustration | W20, W19, W16, W17, W18   | W18, W22, W30, W27, W7     |
| Boredom     | W11, W13, W17, W16, W12   | W16, W5, W4, W13, W29      |
| Other       | W19, W18, W20, W17, W15   | W19, W20, W21, W23, W24    |

On the other hand, notable differences emerge in the duration and distribution of emotional experiences across the project timeline. The extended timeline of the Jordanian group revealed greater emotional fluctuation and variability again, with shifts occurring more frequently and over a broader span of weeks. In contrast, the Scottish group, operating within a shorter timeframe, exhibited more concentrated and stable emotional experiences, with fewer extreme changes and a more focused emotional pattern overall. A clear example of this is seen in the frustration trends: the Scottish students experienced a gradual build-up of frustration from around week 16 through week 20, whereas the Jordanian group experienced more sudden and scattered peaks, including a notably early rise in frustration during week 7, possibly indicating earlier instances of disconnection or challenge in the process. Similarly, in terms of boredom, the Jordanian group reported significant levels as early as week 4. In contrast, the Scottish group did not exhibit notable boredom until week 11, which may suggest that disengagement appeared earlier for the Jordanian students. These contrasts highlight how the structure and pacing of the design timeline may directly influence the emotional rhythms experienced by students.

While both groups followed a similar emotional journey, from initial positivity to end-stage stress, the Jordanian group exhibited more fluctuation, earlier emotional tension, and a staggered process with periods of non-engagement, possibly due to the longer duration or different project structures. In contrast, the Scottish group's emotional progression was more linear and compressed, suggesting a steadier pacing through the design process. These differences could reflect variations in institutional schedules, teaching approaches, or contextual factors influencing student engagement.

### 4.3.2.3 Design Process Activity Emotion Trends

Figure 4-26 presents the relationship between the design process stages and the emotions felt. The project timeline was divided into five periods. Based on the intensity averages of 41 students, the peak moments for each emotion were identified by focusing on the top five highest intensity averages and the five most intense stages over a one-year period.

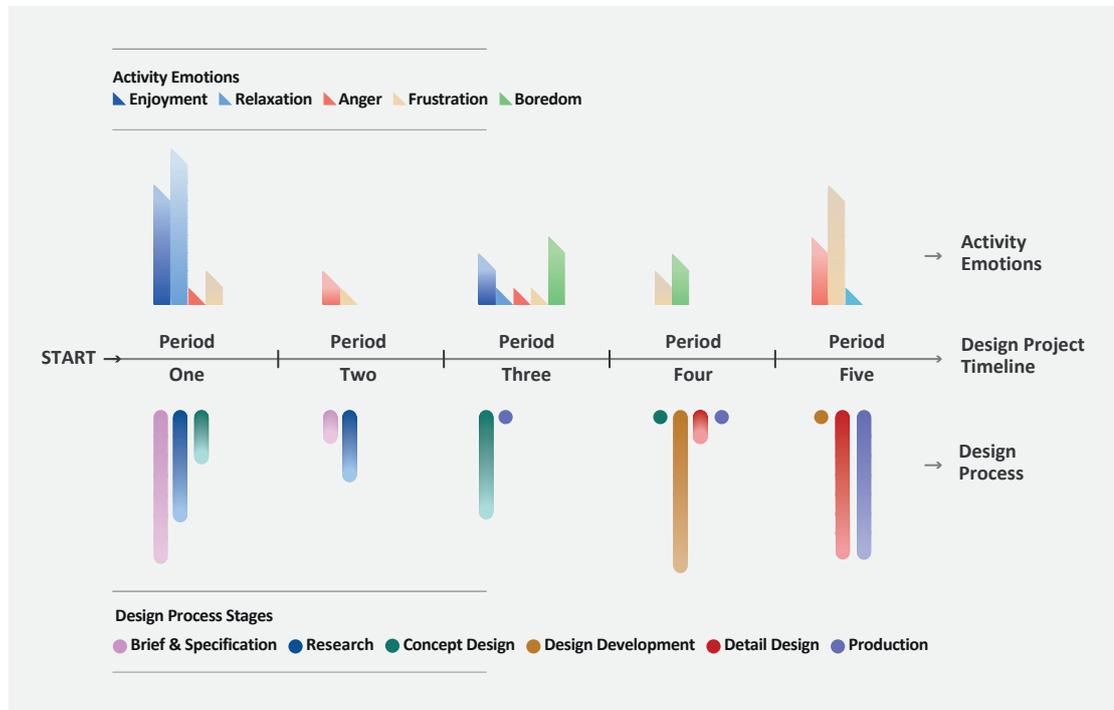


Figure 4-26. Design Process Activity Emotions Distribution Visualisation.

Accordingly, Figure 4-26 shows a number of notable emotional shifts across the design process stages. In the first period, students focused on research, brief and specification stages with higher levels of enjoyment and relaxation. In period three, during the concept design stage, emotional experiences were more mixed. By periods four and five, as students moved into design development, detail design, and production, they felt bored and later, frustration became more dominant. The significant transition is evident in how students' process management and decision-making is impacted by emotions shifting from enjoyment and relaxation to frustration, with boredom starting in between. This highlights the imbalanced distribution of emotions and the design process stage throughout the design project. Positive emotions influence students' decisions, often leading them to remain in these comfortable phases longer, where they encounter a decision paralysis or avoidance loop (Anderson, 2003; McSweeney, 2019) Kurien (Kurien et al., 2014) et al., 2014.

Figure 4-27 compares the average emotional intensity of five key emotions between the Jordanian and Scottish student groups. An apparent similarity between the two groups is the overall emotional pattern: both reported the highest average intensity for enjoyment as a

positive emotion, followed by frustration as a negative emotion. Yet, a comparison between the negative and positive emotions in both groups shows a gradual decline in intensity across the negative emotions. This shared trend suggests that students in both contexts experienced the design process as largely positive, especially in the early phases. Additionally, average scores for relaxation and boredom were relatively similar, pointing to comparable experiences of calmness and disengagement throughout the project. However, differences were also evident. The Jordanian group reported slightly higher levels of enjoyment and frustration, indicating more emotionally intense highs and lows. They also showed slightly higher levels of anger compared to their Scottish counterparts. In contrast, the Scottish group exhibited marginally higher averages in relaxation and boredom, reflecting a more emotionally moderate experience. While both groups followed similar emotional experiences, Jordanian students displayed greater emotional variability, whereas the Scottish students experienced a steadier emotional profile throughout the project timeline.

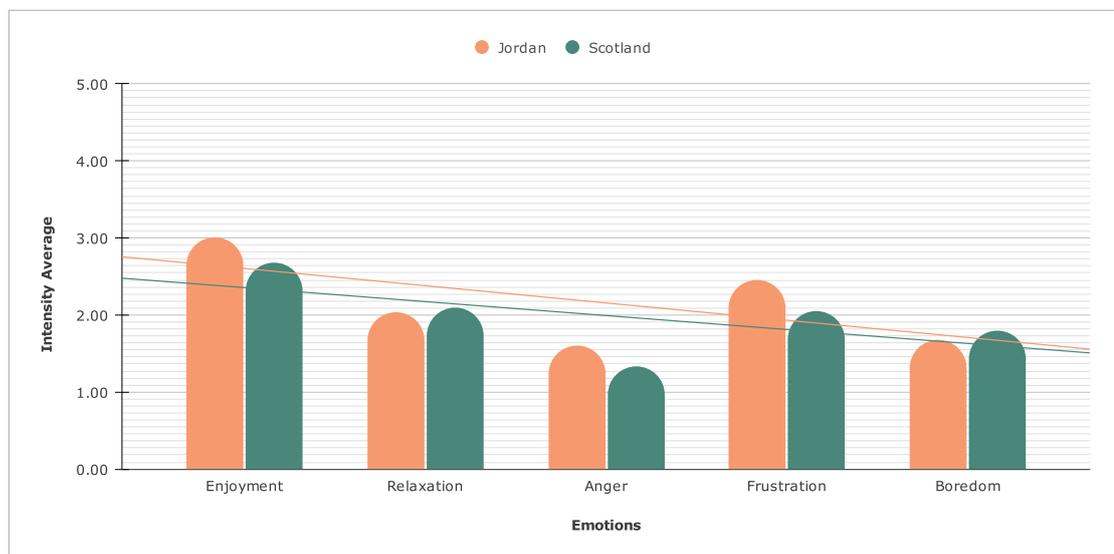


Figure 4-27. Activity emotions Trend Across Jordanian and Scottish Design Students.

### 4.3.3 Design Process: Achievement Emotion Manifestation

As explained before, achievement emotions are emotions tied to students' perceptions and self-reflection regarding their satisfaction with their academic achievements and the outcomes related to these achievements (see 2.4.2.1, pp.118). According to Pekrun et al. (2007) these emotions arise when students reflect on their performance and compare it to their goals or standards. The object focus of these emotions may be the task, the self, or the outcome. Accordingly, emotions emerge when the self is the focus and a successful outcome aligns with personal effort or ability. Similarly, the same emotion may occur when a poor outcome is attributed to internal causes. Through self-reflection, students evaluate their results and develop emotional responses that influence future motivation and learning behaviour. Thus, achievement emotions are not merely reactive but are shaped by ongoing interpretations of success and failure, as well as progress and setbacks. Therefore, this section

includes eight achievement emotions drawn from Pekrun's framework: joy, hope, contentment, relief, anxiety, shame, sadness, and disappointment.

Figure 4-28 presents a line graph showing how students responded to seven different reflective questions using a set of achievement-related emotions. Each line represents one of the questions listed below the graph, and the y-axis (Count) indicates how often each emotion was reported in response to each question. The x-axis lists the emotion categories derived from Pekrun's achievement emotions framework, with additions of 'other', 'emotionlessness', and 'no work'.

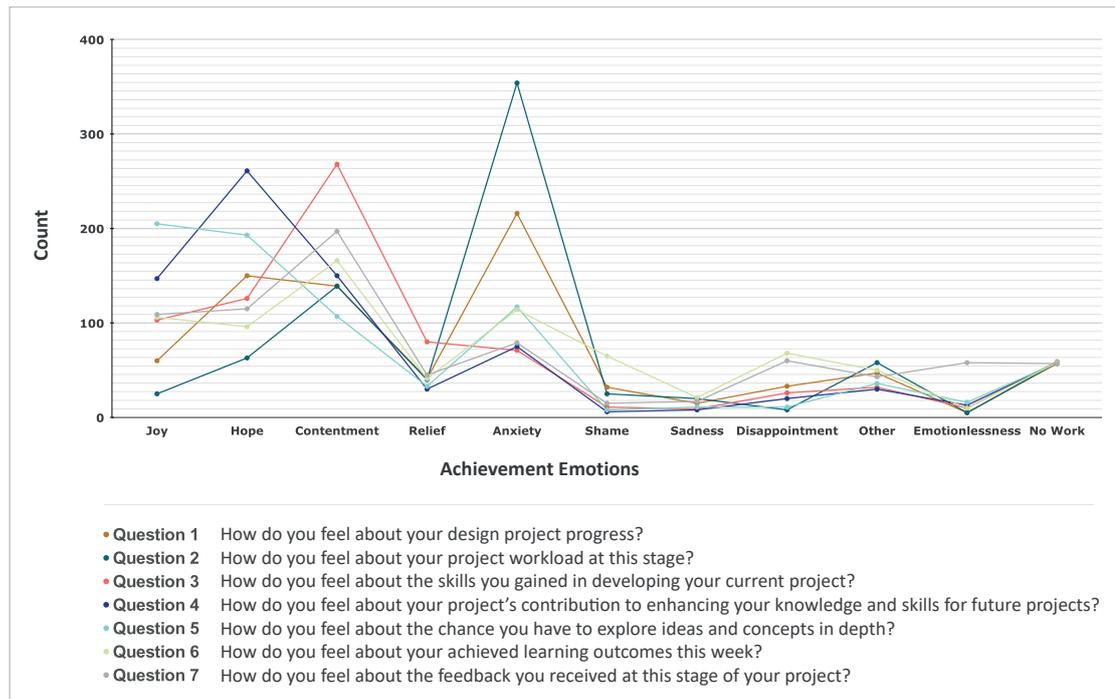


Figure 4-28. Design Process Achievement Emotions Distribution in Response to the Seven Questions.

Across all questions, anxiety emerged as the most frequently reported emotion, peaking significantly in response to questions 1 and 2, which asked about project progress and project workload, indicating that workload and progress are significant emotional stressors. In contrast, hope and joy were prevalent in responses to questions 4 and 5, suggesting that students felt more optimistic when reflecting on their project contribution and opportunities for exploring ideas. Contentment was moderately represented across several questions, yet peaking in question 3 where students felt more optimistic about their skill development while relief appeared infrequently, implying that few students felt a release from stress or pressure, but also peaking in question 3. Negative emotions such as shame, sadness, and disappointment remained low overall, suggesting that while students experienced anxiety, they did not generally feel discouraged. Interestingly, responses to question 6 regarding the achieved learning outcomes and question 7 about the feedback received showed lower emotional peaks, with moderate levels of both positive and negative emotions. In general, hope and contentment show higher presence within the spectrum across the seven

questions. The relatively consistent presence of emotionlessness and no work indicates that some students either disengaged emotionally or did not engage with the project at that moment. Overall, the data reveal that students' emotional responses vary depending on the specific aspect of the project they are reflecting on, with learning and engagement eliciting more positive emotions, and workload evoking the highest emotional strain.

The following analysis presents a 30-week timeline of students' emotional responses to the seven reflective questions, visualised through stacked bar charts. Each colour in the chart represents a different emotion, and the total number of emotions recorded for that week. It is important to note that the decline in the total number of recorded emotions observed in Figure 4-29 to Figure 4-35, during the period from week 21 to week 30, is due to differences in the academic semester timelines between Jordan and Scotland, where the Jordanian academic year spans over 30 weeks, while the Scottish academic calendar year spans over 20 weeks. Despite the difference in timelines between the two groups, the variation did not significantly impact the overall experience or outcomes. Both groups demonstrated a similar emotional trend throughout the study. Although the Jordanian students recorded more weeks with no activity, both group ultimately completed their work within a consistent timeframe of 19 weeks. The questions are as follows:

*Q1: How do you feel about your design project progress.*

*Q2: How do you feel about your project workload at this stage.*

*Q3: How do you feel about the skills you gained previously in developing your current project.*

*Q4: How do you feel about your project contribution in enhancing your knowledge and skills for future projects.*

*Q5: How do you feel about the chance you have to explore ideas and concepts in depth.*

*Q6: How do you feel about your achieved learning outcomes in this week.*

*Q7: How do you feel about the feedback you have received at this stage of your project.*

Accordingly, the figures on the following pages have been relocated to Appendix 16, p.437 where higher-resolution and larger-format versions are provided for improved readability.

### 4.3.3.1 Design Process Achievement Emotion Question One: How do you feel about your design project progress?

Figure 4-29 presents the experienced emotions by students in response to question 1 over the 30-week timeline. In the first 10 weeks, emotions such as joy, hope, and contentment were frequently reported, indicating early-stage enthusiasm, optimism, and satisfaction with project development. These positive feelings were accompanied by regular reports of high anxiety, suggesting that while students felt encouraged, they also experienced pressure and temporary emotional release. Between weeks 11 and 20, emotional complexity increases, with a steady presence of shame, sadness, and disappointment, reflecting growing self-criticism or challenges in progress. Notably, emotionlessness and no work begin to surface more regularly in this middle phase, especially from week 14 onward, possibly indicating disengagement and there is minimal presence of relief. After week 20, the overall emotional count per week drops to 10, with emotions such as anxiety, relief, and contentment remaining high. The appearance of emotionlessness and no work becomes more dominant, reinforcing signs of decrease in emotional energy or reduced project momentum. Overall, the figure captures an emotional arc that begins with motivation and confidence, peaks with emotional complexity and strain, and tapers into a quieter, more emotionally muted conclusion.

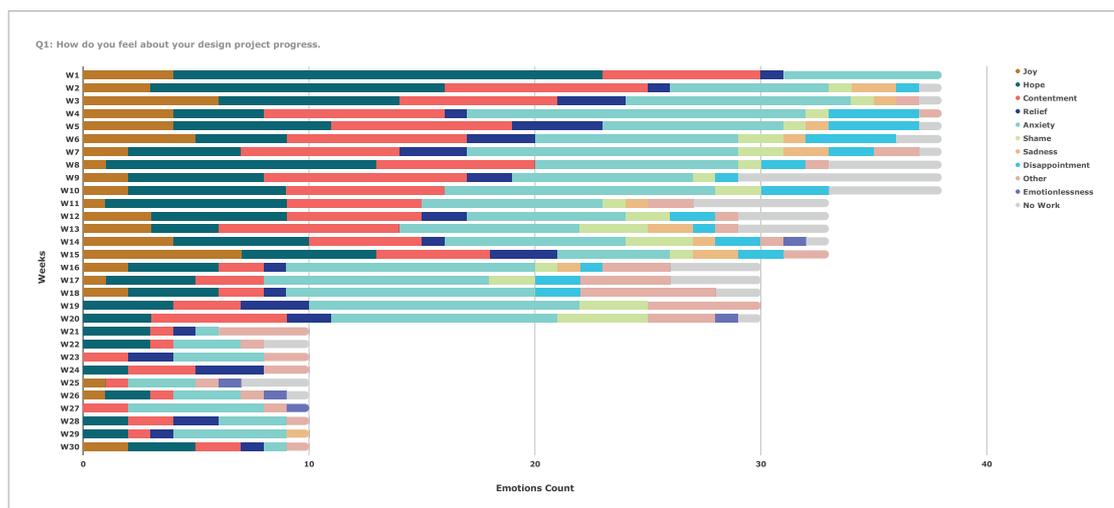


Figure 4-29. Weekly Emotional Responses to Reflective Question One Over a 30-Week Design Project Timeline.

#### 4.3.3.2 Design Process Achievement Emotion Question Two: How do you feel about your project workload at this stage?

Figure 4-30 data reveal that anxiety is the most consistently reported emotion throughout the semester regarding the workload, especially dominant between weeks 1 and 20, which reflects a strong emotional reaction to workload demands. Contentment also appears frequently in the early and mid-phase, suggesting that despite the pressure, some students maintained a sense of satisfaction with how they managed their workload. However, positive emotions such as joy and hope occur less frequently, indicating that workload was not typically associated with pleasant emotions. As the semester progresses into weeks 10 to 20, there is a notable increase in emotionlessness, no work, and disappointment. During week 21 onwards, while anxiety and relief still appear, a variety of other emotions like shame, sadness, and disappointment emerge more visibly, suggesting that students' emotional responses to workload became conflicted toward the end. The overall trend demonstrates that workload consistently triggered emotional intensity, predominantly through stress-related emotions, with a gradual shift toward disengagement and emotional neutrality as the project progressed.

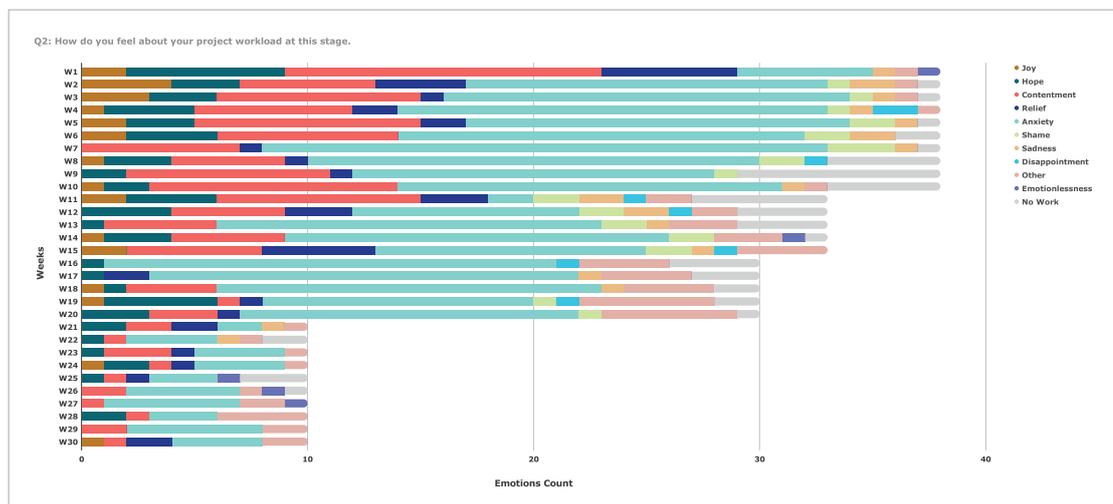


Figure 4-30. Weekly Emotional Responses to Reflective Question Two Over a 30-Week Design Project Timeline.

### 4.3.3.3 Design Process Achievement Emotion Question Three: How do you feel about the skills you gained previously in developing your current project?

The data in Figure 4-31 reveals that contentment is the dominant emotions in students' responses to question 3 during the first 20 weeks followed by joy and hope. This strong presence of positive emotions suggests that students largely viewed their skill development experiences as rewarding and affirming. Anxiety and relief appear consistently throughout, indicating some pressure when applying previously learned skills. Between weeks 4 and 10, there is a sort of balance between positive and negative-related emotions, with relief and anxiety often reported together, implying students may have felt both capable and challenged. From week 11 onwards, the emotional range widens, with occasional appearances of shame, sadness, and disappointment, though these remain minimal. After week 20, the overall emotional input declines, yet the emotional variety remains. During this later phase, emotions like emotionlessness and no work become more visible, suggesting reduced emotional engagement. Despite the decline in participation, joy and hope persist even in the final weeks, indicating a sustained sense of value in skill acquisition for some students. The emotional experiences reflect a generally positive perception of previously gained skills, tempered by occasional stress and end-of-term disengagement.

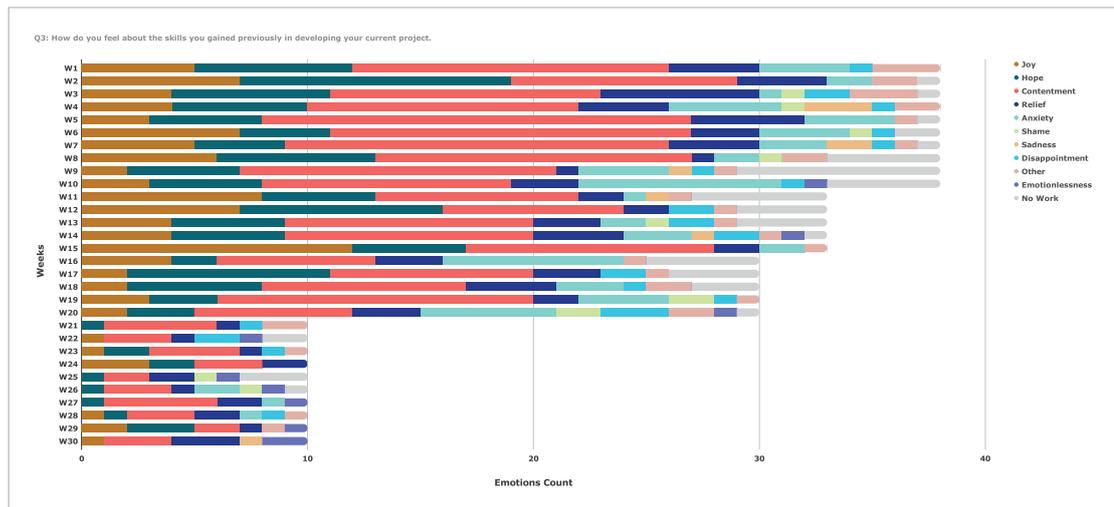


Figure 4-31. Weekly Emotional Responses to Reflective Question Three Over a 30-Week Design Project Timeline.

#### 4.3.3.4 Design Process Achievement Emotion Question Four: How do you feel about your project contribution in enhancing your knowledge and skills for future projects?

Figure 4-32 data shows that students consistently associated positive emotions, particularly hope and joy, with their project’s contribution to enhancing knowledge and skills for future projects, especially in the first 20 weeks, as well as, contentment. Hope is dominant throughout this period. Joy and contentment also appear regularly, particularly in the early weeks 1 to 10, indicating initial excitement and satisfaction. Alongside these, anxiety and relief appear steadily, reflecting the pressure of preparing for future challenges while also feeling moments of progress. Midway through the timeline, around week 11 to 17, shame, disappointment, and emotionlessness surface more frequently, suggesting increasing emotional complexity as students reflect more critically on their growth. From week 21 emotional diversity remains, with a continued presence of hope, relief, and occasional joy, balanced against emotions like anxiety, emotionlessness, and no work. This suggests that even as participation declined, students still engaged emotionally, albeit with more mixed or subdued feelings, about the long-term impact of their project work. Overall, the data reflect a predominantly positive and future-oriented emotional response that gradually becomes more nuanced and reflective over time.

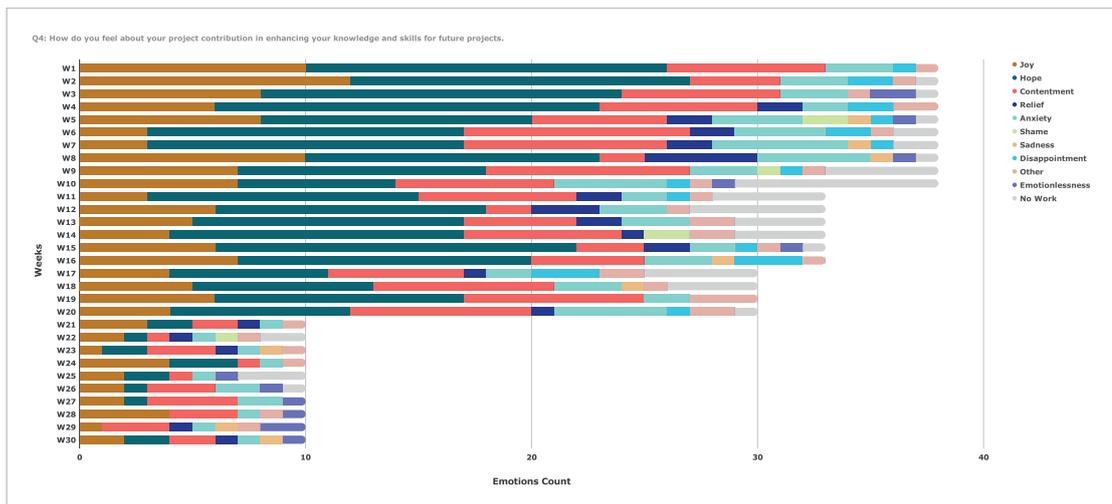


Figure 4-32. Weekly Emotional Responses to Reflective Question Four Over a 30-Week Design Project Timeline.

#### 4.3.3.5 Design Process Achievement Emotion Question Five: How do you feel about the chance you have to explore ideas and concepts in depth?

Figure 4-33 data shows that students strongly associated joy and hope with their opportunities to explore ideas and concepts in depth, during the whole period. Joy appears as the most dominant emotion across nearly all early weeks, indicating that the chance to engage with creative and conceptual exploration was a highly rewarding experience. Hope and contentment are also prominent, suggesting students were optimistic and satisfied with their intellectual engagement. Alongside these positive emotions, anxiety and relief were regularly reported, indicating that while exploration was fulfilling, it was also demanding and occasionally stressful. From around week 10 onward, emotional responses become more varied, with the emergence of shame, sadness, disappointment, and emotionlessness, especially between weeks 14 and 20. These shifts suggest that as the semester progressed, students began to face more challenges or limitations in their ability to explore ideas freely. After week 20 joy, hope, and relief remain present. Meanwhile, emotions like no work and emotionlessness become more frequent. Overall, the data highlights that students found deep exploration of ideas to be highly enjoyable and motivating, though this emotional intensity gradually gave way to fatigue and a more complex emotional landscape as the semester advanced.

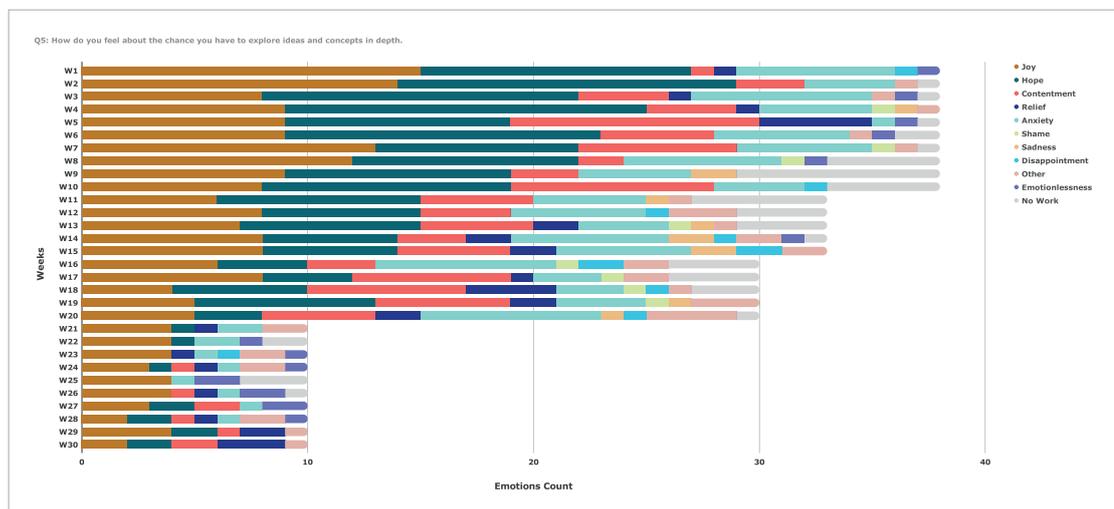


Figure 4-33. Weekly Emotional Responses to Reflective Question Five Over a 30-Week Design Project Timeline.

#### 4.3.3.6 Design Process Achievement Emotion Question Six: How do you feel about your achieved learning outcomes in this week?

Figure 4-34 data illustrates a broad emotional range in students' weekly reflections on their achieved learning outcomes, with the most active emotional engagement occurring during the first 20 weeks. Joy, hope, and contentment dominate this period, suggesting that students often felt positively about their learning achievements. However, these emotions are accompanied by substantial levels of anxiety, relief, shame, and disappointment, indicating that learning outcomes were often experienced as emotionally complex, simultaneously satisfying and stressful. From week 1 onwards, these emotions appears more consistently, possibly reflecting internal pressure to meet personal expectations. Between weeks 8 and 15, emotional variety peaks, with notable increases in shame, sadness, disappointment, and emotionlessness, implying a more critical or uncertain phase in students' perception of their learning. After week 20 the emotional palette remains diverse. Emotions such as anxiety, relief, and no work remain common, suggesting reduced but still reflective engagement. Overall, the data reveal that students' feelings toward their weekly learning outcomes were highly dynamic, starting with optimism and energy, gradually becoming more reflective and emotionally complex as the semester progressed.

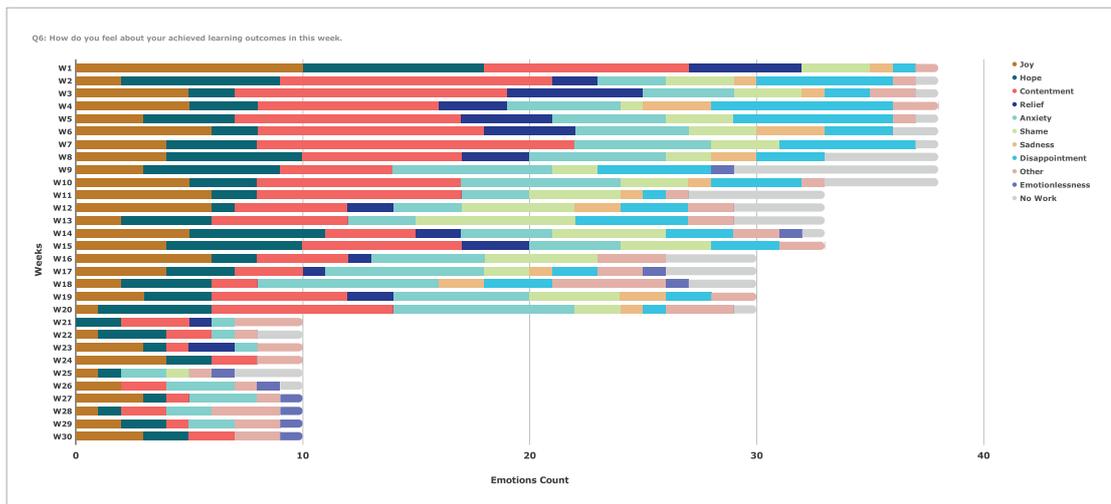


Figure 4-34. Weekly Emotional Responses to Reflective Question Six Over a 30-Week Design Project Timeline.

#### 4.3.3.7 Design Process Achievement Emotion Question Seven: How do you feel about the feedback you have received at this stage of your project?

The data in Figure 4-35 indicates that students experienced a wide range of emotions in response to the feedback they received throughout the 30-week project timeline. In the early weeks from week 1 to week 10, joy, hope, and contentment were the most prominent emotions, suggesting that initial feedback was generally perceived positively and perhaps reinforced students' confidence and motivation. Alongside these, relief and anxiety were also commonly reported, reflecting a mix of reassurance and tension about meeting expectations. From week 11 onward, there is a notable increase in negative emotions such as shame, disappointment, sadness, and emotionlessness, especially in weeks 13 to 20. This shift implies that feedback during this phase may have become more critical or complex to process, challenging students' self-perception or motivation. Emotionlessness also emerges consistently from mid-semester through the final weeks, possibly pointing to emotional fatigue or detachment. After week 20 and even through the final weeks, feedback continues to evoke a blend of relief, anxiety, and contentment, suggesting that students remained reflective about the role of feedback, though perhaps with reduced intensity. Overall, the data reveal that feedback prompted complex emotional responses over time, shifting from early encouragement and motivation to mid-project emotional strain, followed by a quieter yet still emotionally mixed closing phase.

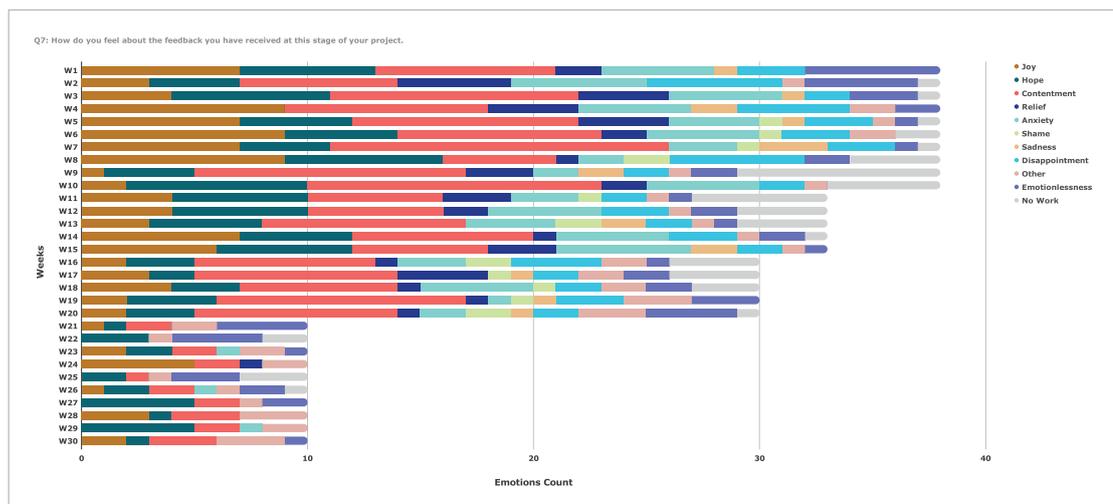
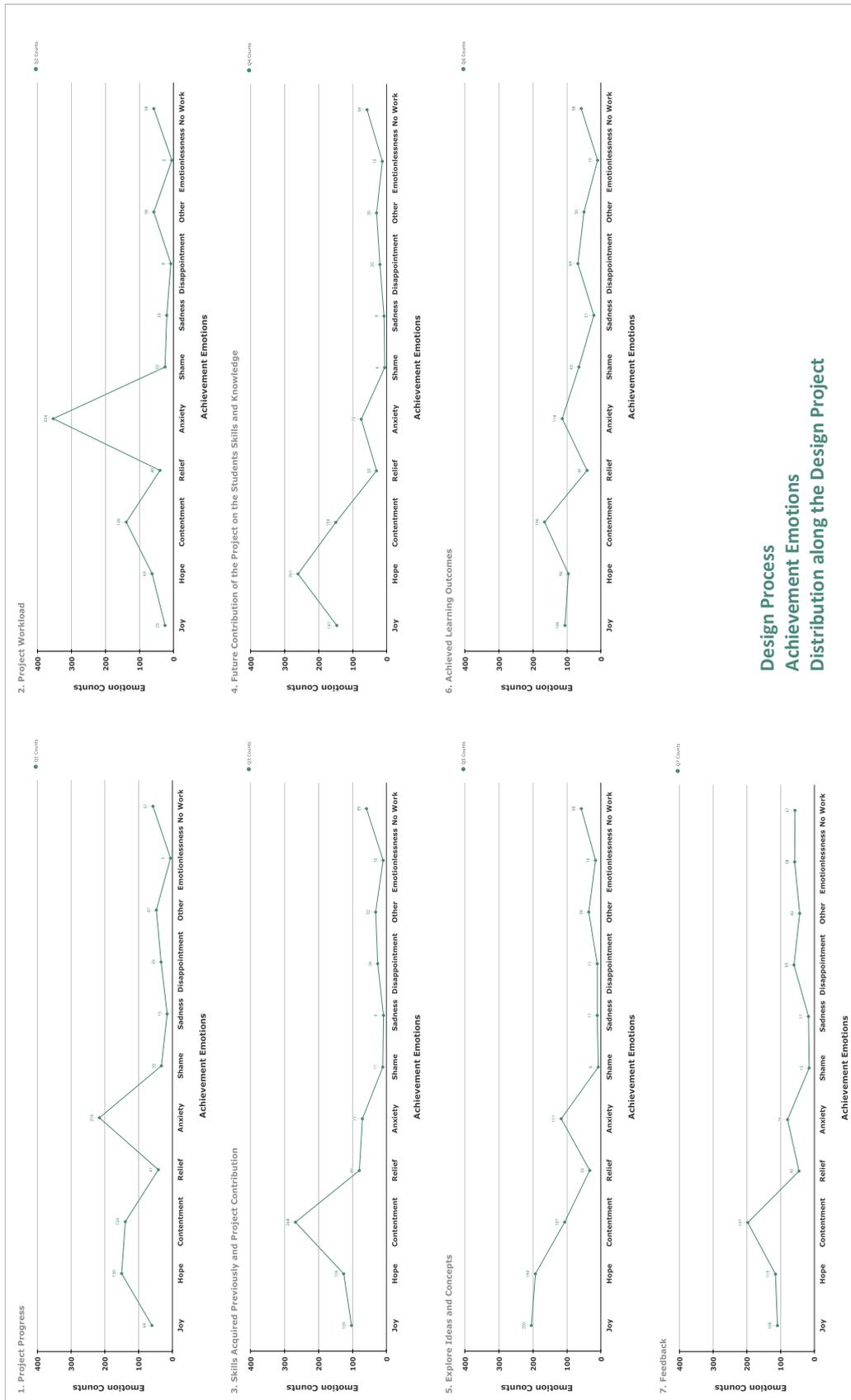


Figure 4-35 Weekly Emotional Responses to Reflective Question Seven Over a 30-Week Design Project Timeline.

#### 4.3.3.8 Design Process Achievement Emotion Students' Engagement Lines

Figure 4-36 provides a more detailed and clarified analysis of the eight emotions originally presented in Figure 4-28. The figure displays seven line charts representing the total emotional responses to each of the seven reflective questions. Each chart plots the frequency of reported emotions across different design learning dimensions.

Accordingly, an obvious similarity across all questions is the high presence of contentment and hope, suggesting that, in general, students found satisfaction and optimism across multiple aspects of the design learning process. In particular, contentment peaked in questions 3, 4, 5, and 7 (skills acquired, project contribution, idea exploration, and feedback), reflecting that these dimensions were often positively internalised. Additionally, joy and hope maintained a steady presence across most charts, particularly in questions 1, 3, and 5, suggesting that reflective aspects of the project were experienced positively. Conversely, anxiety is the most pronounced emotion, peaking sharply in question 2 (project workload) with a count of (354), and question 1 (project progress) with (216) which is far higher than in any other outcomes aspects. This clearly marks workload as the most emotionally charged and stress-inducing aspect of the project, highlighting a unique emotional response that differs significantly from the other categories. In contrast, relief, shame, sadness, and disappointment were relatively low across all questions, though they were slightly more present in questions 6 and 7 (learning outcomes and feedback), where students reflected more critically on results and external evaluations.



**Design Process Achievement Emotions Distribution along the Design Project**

Figure 4-36. Design Process Achievement Emotions Distribution along the Design Project.

However, questions 3 and 4, both addressing skill development and future contributions, show similar emotional profiles: high contentment, moderate hope, and very low negative emotions. This implies that students largely viewed these reflective prompts as affirming, forward-looking, and low-stress. Question 5 about exploring ideas and concepts shares this trend as well, with joy (205) being highest here, indicating that the creative and intellectual freedom involved in design exploration was highly fulfilling. By contrast, questions 1, 2 and 6 introduce more emotional complexity. Question 6 shows increased levels of shame (65), sadness (21), and disappointment (68), pointing to the emotional challenges involved in evaluating one's own learning outcomes. While question 1 and 2 shows a higher level of anxiety, which was recorded as (216) and (354) respectively.

There is a clear correlation between the questions' reflection dimension and the emotional responses'. When students reflected on internal or personal growth areas (e.g., skills, knowledge, creative exploration), positive emotions such as joy, hope, and contentment were more prevalent. However, when questions addressed external evaluations or time pressure (e.g., workload, feedback, outcomes), negative emotions such as anxiety, shame, and disappointment appeared more frequently. This suggests that students' emotions are closely tied to perceived autonomy and control, positive when centred on self-driven progress, and negative when dealing with pressure, performance, or evaluation.

#### 4.3.3.9 Design Process Achievement Emotion Country Manifestation

In this section, the data is presented by country to gain insights into the individual perspectives within each group. The intention is not to compare the groups against each other, but rather to uncover interesting similarities and differences that can be used to better understand the unique and shared elements within both groups of the design students.

Figure 4-37 presents the emotional responses of Jordanian design students across seven reflective questions related to their project experience. Each bar represents the cumulative emotional data for a specific question, offering insight into how students felt about various aspects of their design process achievements.

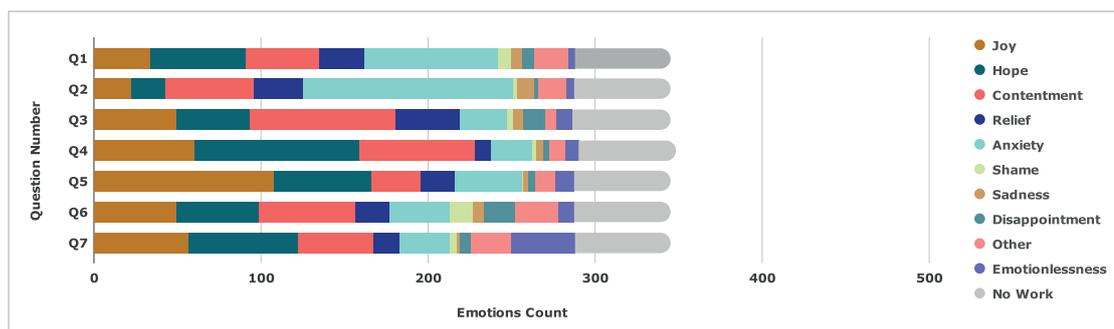


Figure 4-37. Achievement Emotions Distribution among the Questions, Jordanian Design Students.

Across all questions, anxiety is the most frequently reported emotion, particularly in relation to project progress (Q1), workload (Q2), and learning outcomes (Q6). This suggests that these areas consistently demand a lot from students. Despite this, contentment and hope appear

strongly almost in all the questions, especially in questions related to skill acquisition (Q3), the project’s future contribution to knowledge (Q4), idea exploration (Q5), and feedback (Q7). This indicates that students generally felt fulfilled and optimistic when engaging in growth-oriented or creative components of the project, and when they get validation from feedback.

Joy is also present across all questions, most notably in responses to questions about future learning potential and concept exploration (Q5). These findings point to a sense of enjoyment and satisfaction associated with design wider interest. In contrast, emotions such as shame, sadness, and disappointment are more prevalent in (Q6) and (Q7), where students reflect on their achieved learning outcomes and the feedback received. These responses suggest that evaluative moments, especially those involving self-assessment or external critique, evoke more complex and often negative emotional reactions. Finally, a significant number of students selected emotionlessness or reported no work, particularly in (Q7). This may reflect disengagement, emotional fatigue, or uncertainty in how to process or respond to feedback. Overall, the data highlights that while Jordanian design students experience high levels of stress in certain areas, they also demonstrate a strong sense of satisfaction.

Further, Figure 4-38 illustrates the emotional responses of Scottish design students. Also, each bar corresponds to a question and represents the total emotional responses collected, offering insight into how students felt across different aspects of their design process achievements.

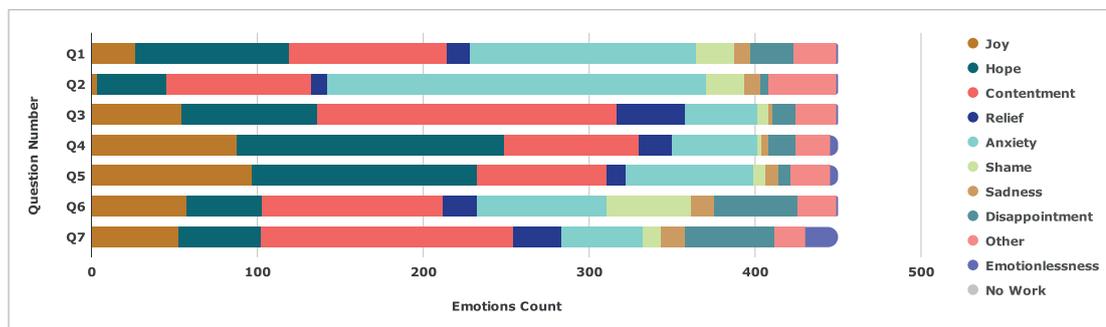


Figure 4-38. Achievement Emotions Distribution among the Questions, Scottish Design Students.

Across all seven questions, contentment consistently appears as one of the most dominant emotions, particularly in relation to skills gained (Q3), knowledge enhancement (Q4), achieved learning outcomes (Q6), and feedback received (Q7). This suggests that Scottish students generally viewed these aspects of their education positively and felt satisfied with their development and guidance. Hope is also prevalent throughout, especially in (Q3), (Q4), and (Q5), indicating that students maintained a forward-looking, optimistic mindset in areas tied to creativity and long-term learning.

While anxiety remains prominent, especially related to project progress (Q1), workload (Q2). Yet, anxiety appears more balanced compared to the Jordanian dataset. This suggests that although workload and evaluation prompted stress, it was perhaps less overwhelming or

better managed. Joy features most clearly in (Q4) and (Q5), pointing to moments of enjoyment related to skills gained and the contribution they aim to. Meanwhile, relief is modest but consistently present across multiple questions, implying periodic emotional release as students navigated challenging phases.

More negative or complex emotions, such as shame, sadness, disappointment, and emotionlessness, show a moderate presence, especially in (Q6) and (Q7). These emotions reflect the emotional demands of evaluating one's outcomes and receiving feedback, common moments of vulnerability in educational settings. The presence of no work is minimal, indicating that most students were consistently engaged with the reflective process.

Overall, the figure reveals that Scottish design students responded to their projects with a relatively balanced emotional profile than Jordanian. While anxiety and pressure were present, they were accompanied by high levels of contentment and hope, especially in response to personal growth and creativity. This suggests a learning environment where challenges coexisted with emotional resilience and a sense of progress.

Moreover, Figure 4-39 illustrates the weekly distribution of emotions reported by Scottish students over a 20-week design project timeline. It reveals clear trends in how emotional responses shifted as the project progressed.

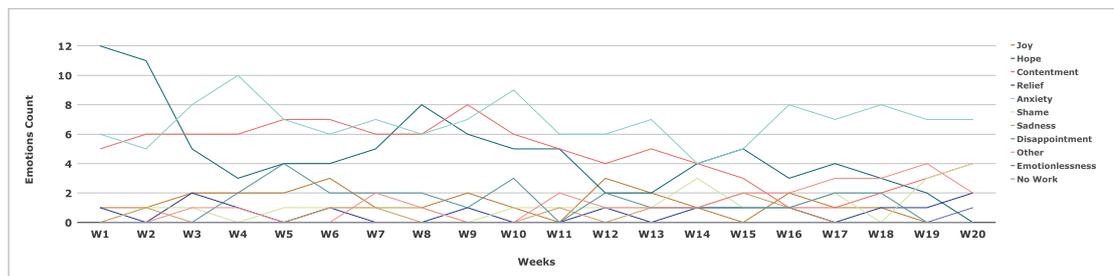


Figure 4-39. Achievement Emotions Distribution during weeks, Scottish Design Students.

At the beginning of the project in week 1, hope was the most frequently reported emotion, suggesting a strong sense of optimism and motivation at the outset. However, hope gradually declined by week 6 and remained at a lower, more stable level throughout the remainder of the project, reflecting a tapering of initial enthusiasm as students encountered real project demands. In contrast, anxiety increased during the early weeks, peaking around weeks 4 and 10, and then persisted at moderate levels in the later weeks. This consistent presence indicates that pressure and stress became ongoing emotional themes as the project developed.

Contentment remained relatively steady across the 20 weeks, with minor fluctuations, pointing to a baseline sense of satisfaction or acceptance with project progress. Relief appeared sporadically, with small spikes particularly around weeks 6 and 12, likely representing moments when students completed key tasks or overcame significant

challenges. Negative emotions such as shame, sadness, and disappointment were present at low levels but peaked at certain points, especially around weeks 6, 12, and 14, which may correspond with periods of evaluation, critique, or self-assessment. Meanwhile, emotionlessness and no work were infrequent but slightly more visible in the later weeks, possibly reflecting emotional fatigue or disengagement toward the end of the project.

Though joy and hope were present in the early phase, they occasionally resurfaced in the later weeks, suggesting that students still experienced moments of creative fulfilment or regained motivation. Overall, the data reveals a nuanced emotional arc: students began with energy and optimism, gradually encountered increasing pressure, but maintained a degree of satisfaction and resilience throughout. This pattern underscores the emotional complexity of design projects and highlights the need for structured emotional reflection and support within design education.

Similarly, Figure 4-40 presents a 30-week timeline of Jordanian student-reported emotions, showing how different emotional experiences fluctuated throughout the duration of a design project. Yet the chart reveals more complex and fluctuation emotional pattern compared to Scottish students, suggesting a more fragmented level of engagement over time.

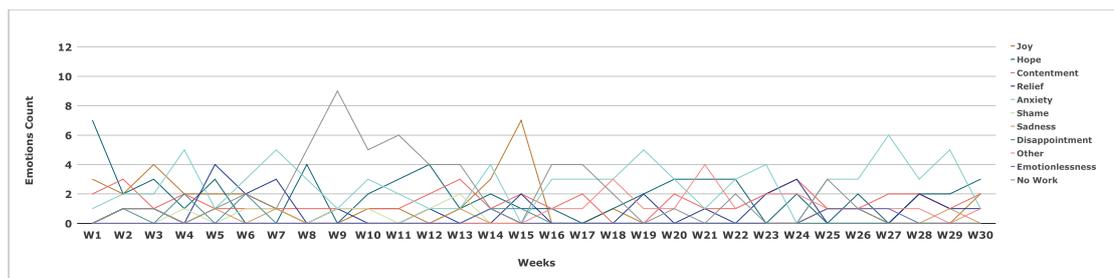


Figure 4-40. Achievement Emotions Distribution during weeks, Jordanian Design Students.

One of the most noticeable features is the spike in no-work responses during week 9, which reached the highest count on the chart. This may indicate a period of disengagement, possibly due to workload fatigue, project overload, or a break in scheduled activity. Another sharp peak appears for joy in week 15, suggesting that students experienced a moment of high satisfaction or creative fulfilment at that point, potentially tied to a successful milestone, breakthrough, or evaluation feedback.

Anxiety appears consistently across many weeks, although at a relatively moderate level compared to other datasets. This consistency implies that while stress was present, it did not escalate dramatically and may have been more manageable or normalised over time. But peaks can be observed at the end of the project. Emotionlessness, sadness, and disappointment also occur periodically, especially between weeks 6 and 18, indicating intermittent emotional strain, likely linked to evaluations or self-doubt.

Positive emotions such as hope, contentment, and relief appear less frequently and show fluctuating patterns, with no clear peaks. Their lower visibility suggests either reduced emotional highs or perhaps less engagement in moments of reflective affirmation. The diversity of emotional responses throughout the 30 weeks, including the presence of both positive and negative emotions, reflects the complex and varied emotional experiences of long-term project work.

In summary, this figure highlights a less stable emotional journey compared to previous datasets. The data points to intermittent emotional engagement, isolated moments of joy or stress, and a relatively even spread of low-level emotions. It suggests a need to better understand and support students' emotional sustainability over extended project timelines, particularly in identifying the causes of disengagement and reinforcing moments of positive affirmation.

Figure 4-41 presents the comparison between Scotland and Jordan, revealing both shared emotional patterns and notable distinctions in how students emotionally experienced their design projects.

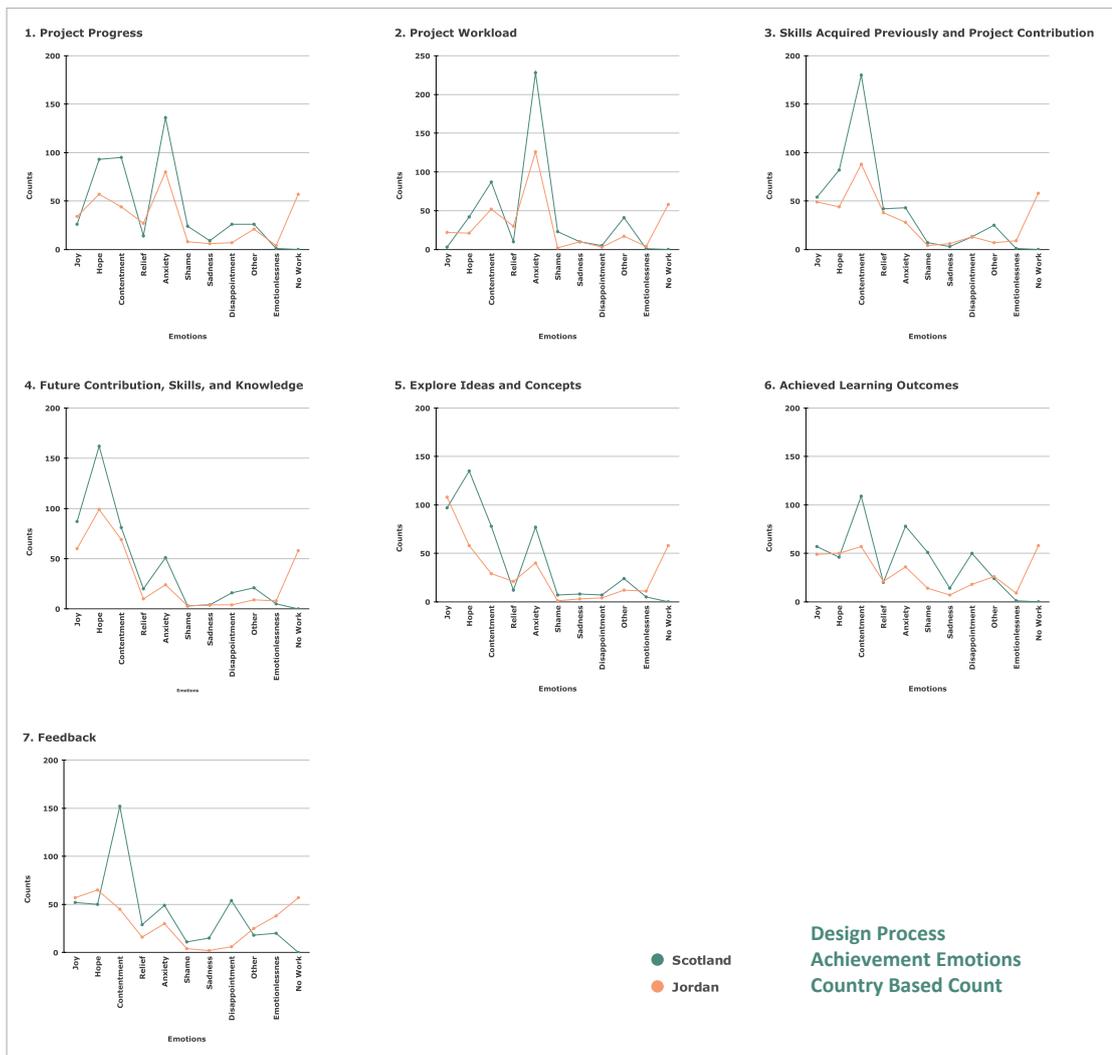


Figure 4-41. Design Process Achievement Emotions Country-Based Count.

In both contexts, anxiety was the most frequently reported emotion, particularly in relation to project workload and progress, reflecting a common pressure around managing time and expectations. Contentment and hope were also present across both groups, especially in responses related to skill development and idea exploration, suggesting that students from both countries found these aspects rewarding and motivating. However, Scottish students reported consistently higher levels of positive emotions such as contentment, hope, and relief, indicating more stable emotional engagement. In contrast, Jordanian students showed higher levels of emotionlessness and no work, particularly in later stages like learning outcomes and feedback, pointing to emotional fatigue or disengagement. These differences highlight how emotional experiences in design education may be influenced by cultural, structural, or pedagogical factors, with Scotland showing greater consistency in emotional involvement and Jordan revealing more variation, particularly in response to evaluative moments.

Accordingly, Figure 4-42 shows clear similarity in the overall emotional hierarchy: both groups most frequently reported contentment, followed by anxiety, hope, and joy, highlighting a shared emotional structure in response to the design learning experience. However, significant differences exist in the proportion and distribution of these emotions. Scottish students reported considerably higher counts for nearly all positive emotions, particularly contentment, hope, and relief, suggesting stronger or more consistent positive emotional engagement. In contrast, Jordanian students reported a much higher frequency of no work and emotionlessness, indicating phases of disengagement or detachment not seen to the same extent in the Scottish group. Negative emotions like shame, sadness, and disappointment were present in both groups, but were more prominent among Scottish students, possibly due to greater reflection or openness in reporting difficult emotions. Overall, while both groups share similar emotional categories, the Scottish data reflects deeper emotional engagement, whereas the Jordanian data points to higher withdrawal or emotional fatigue at certain stages.

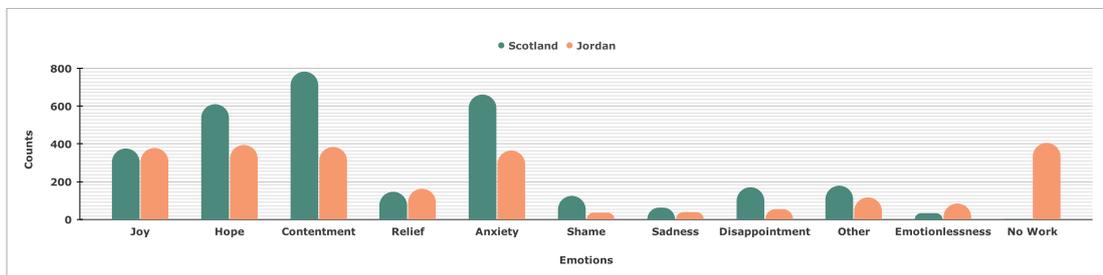


Figure 4-42. Achievement Emotions Trend Line Across Jordanian and Scottish Design Students.

### 4.3.4 Emotion Tracker Results Significance

The Emotion Tracker provides several significant findings about the emotional experiences of design students during their design process (Figure 4-43).

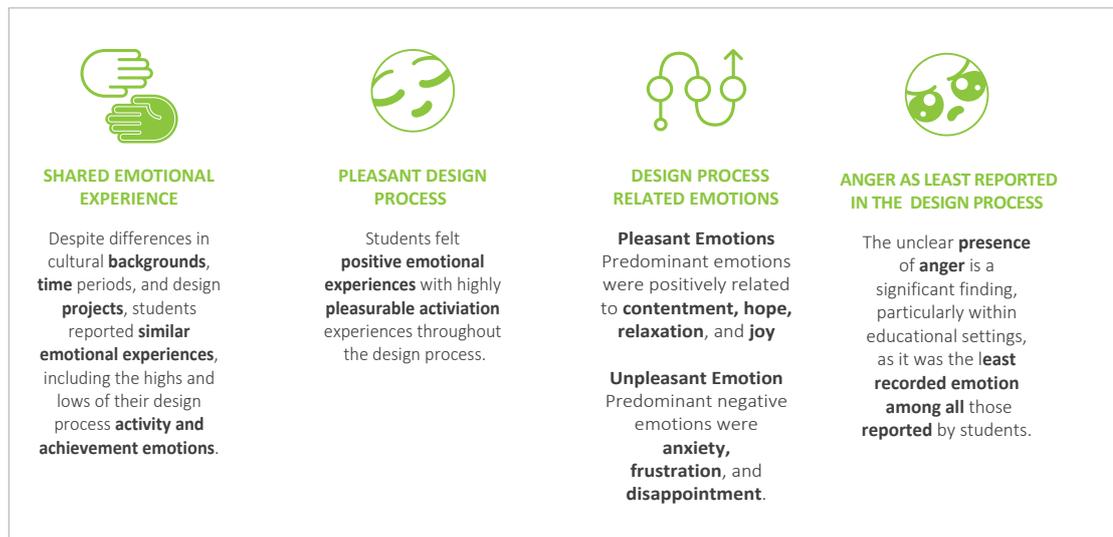


Figure 4-43. Emotion Tracker Findings Highlights.

The results gathered through the emotion tracker provide meaningful insights into the emotional experiences of design students during the design process. The most significant findings of the Emotion Tracker exploratory study are as follows:

- First, there was a clear shared emotional experience across diverse student groups. Regardless of cultural background, project type, or time period, students reported similar patterns of emotional highs and lows. This indicates that certain emotional responses, particularly those linked to design activity and achievement, are consistent elements of the design process experiences.
- Second, the design process was overwhelmingly described as a pleasant emotional journey. Students frequently associated the process with positive emotional experiences marked by pleasurable activation.
- Third, specific emotions related to the design process emerged consistently. The most commonly reported pleasant emotions were contentment, hope, relaxation, and joy, highlighting students' sense of satisfaction and forward-looking optimism. At the same time, unpleasant emotions such as anxiety, frustration, and disappointment were also reported, mainly during periods of pressure, evaluation, or uncertainty.

- Fourth, the appearance of the word 'fine' as an expressed emotion during the design process.
- Fifth, anger emerged as the least intense emotion among students, highlighting anger apparent missing in the design process. On average, the intensity of anger was rated at 1, primarily due to the Likert scale starting from this baseline. Interestingly, some students rated it as 0, further emphasising anger irrelevance. This insight, consistent with the previous study, reinforces that anger is absent in modern design education settings.
- A new emotional phenomenon emerged during the study, which we have termed the Emotionlessness State. Students reported experiencing no emotion during certain unexpected stages and times in the design process. This state suggests a previously unexplored aspect of emotional detachment in the design experiences. This discovery opens new avenues for understanding the complex emotional dynamics of the creative process.

Together, these findings emphasise that the design process is an emotionally charged experience. Positive and negative emotions, without extremes like anger, point to the importance of fostering emotional resilience, reflection, and support mechanisms within design education.

## 4.4 The Feedback Sheet (Questionnaire) Results

This section presents the results of the feedback sheet (questionnaire), which was administered through an online self-completion questionnaire to capture students' reflections after participating in the emotion-tracking study. Designed as a structured and adaptive questionnaire, the feedback sheet served as a complementary data collection tool, enabling both quantitative and qualitative insights across four core analysis areas (Figure 4-44):

- Tracker usability and reliability.
- Design process-related emotions.
- Internal and external impact factors.
- Design students' emotional states.

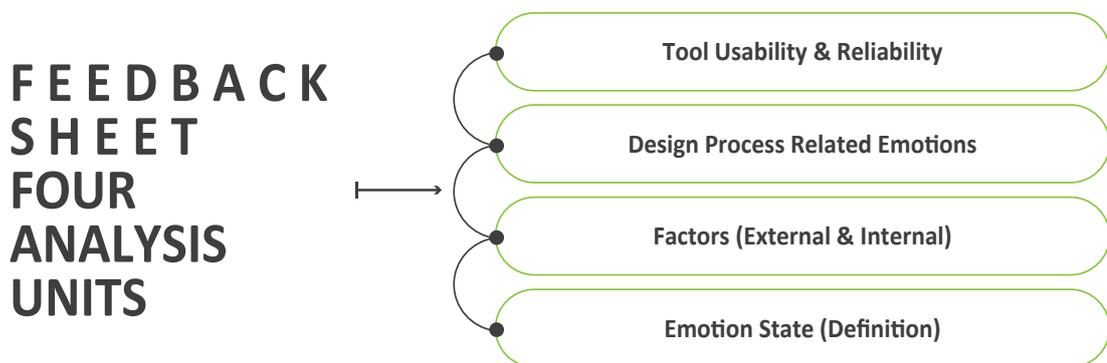


Figure 4-44. Feedback Sheet Analysis Units.

The questioner aims to answer the following research questions:

**RQ1. What emotional experiences do design students encounter throughout the design process?**

*RQ1.6. What is the meaning of emotions from the design students' perspectives?*

**RQ2. How do the design students' emotional experiences affect their design process?**

*R.Q2.3. What are the factors impacting students' design process?*

**RQ3. How can the emotions of design students be effectively incorporated into their design process journey?**

*RQ3.1. What is the usability and reliability of emotion tracking tools during the design process?*

By aligning the questionnaire structure with the study's main research questions, the online format allowed for efficient data collection, personalised response, and opportunities for open reflection, particularly valuable in exploring students' emotional interpretations for their experiences. The results presented here reflect input from 39 design students across two countries and two academic semesters, highlighting key themes and emergent emotional

insights that informed subsequent study phases. Therefore, two separate questionnaires were necessary. Although the core questions remained the same, additional questions were incorporated into the second questionnaire based on insights and emerging findings identified from the first semester's results.

Figure 4-45 illustrates the number of students who used the Emotion Tracker per semester. The total number for all students who used the Emotion Tracker are 41 students. 28 students engaged with it across both semesters, 3 students joined in the second semester participated, and 11 students used the tracker only in the first semester.

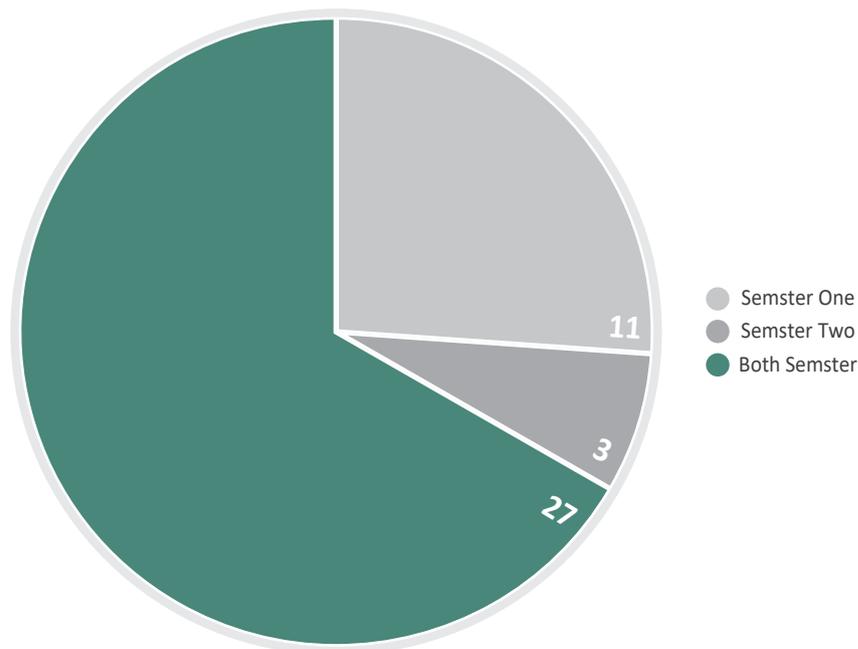


Figure 4-45. Students Using the Emotion Tracker Semester distribution.

#### 4.4.1 Tracker Usability and Reliability

In this section the analysis is based on six questions from the questionnaire that evaluated the Emotion Tracker as a tool for understanding emotional experiences from the students' perspective (see Table 3-6, 3.4.3, p.170).

##### 4.4.1.1 Students' Evaluation of the Emotion Tracker Tool

Figure 4-46 presents four pie charts that provide insights into students' experiences using the Emotion Tracker tool during the design process by using end-questions. The first chart shows that the majority of students (86.5%) reported enjoying the process of tracking their emotions, suggesting that the activity was generally well-received and positively integrated into their workflow. In comparison, only (13.5%) found it unenjoyable. The second chart reflects similar sentiment, with (89.2%) of students indicating that the tool effectively assisted them in tracking their emotional experiences while designing, reinforcing the

tracker's functional value. The third chart indicates that (75.7%) of students found the Emotion Tracker helpful overall, while (24.3%) did not, suggesting some variation in how students perceived its usefulness, likely due to individual preferences or engagement levels. Most notably, the fourth chart reveals that (97.3%) of students felt that using the tracker increased their awareness of their emotions during the design process, underscoring its role as a reflective and awareness-building tool.

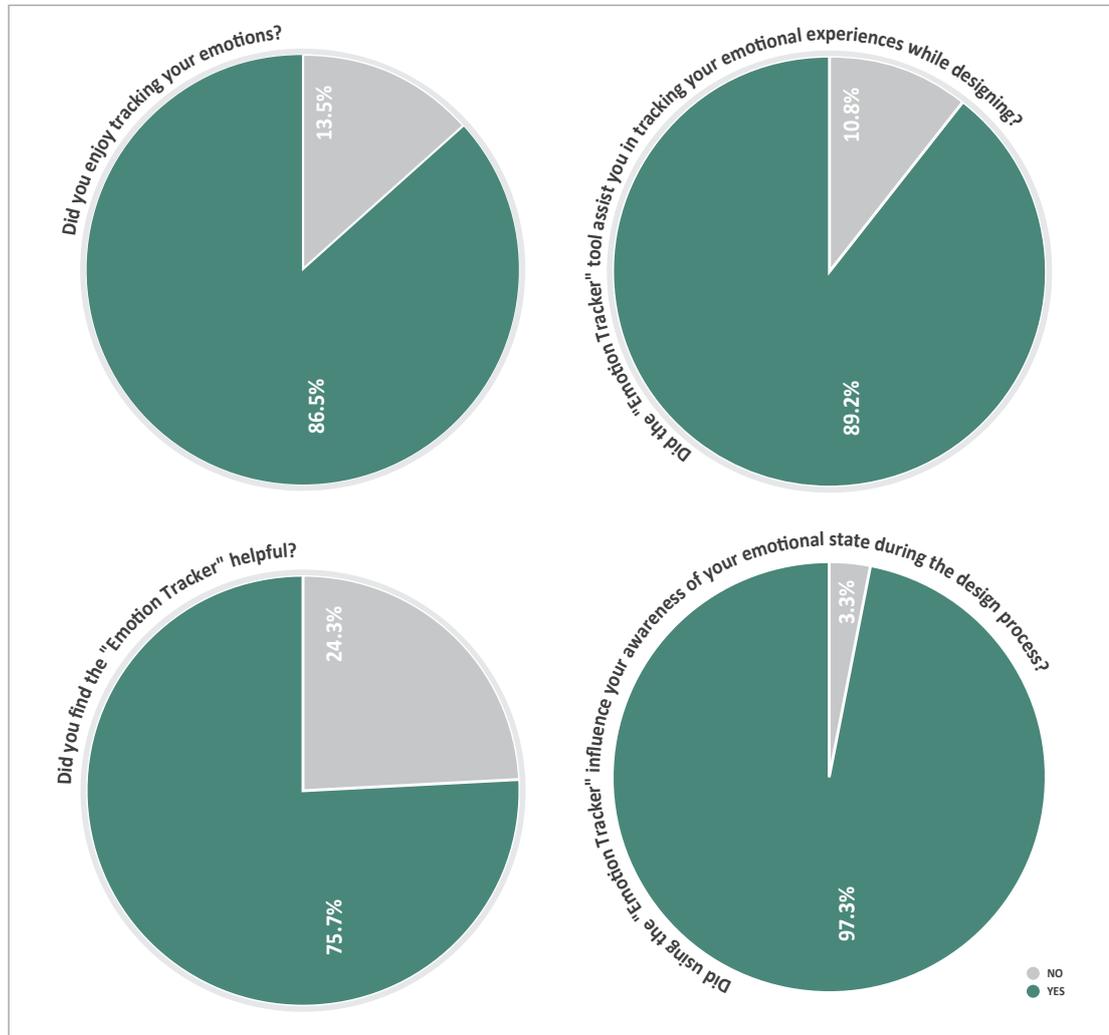


Figure 4-46. Closed-End Questions: Students' Evaluation of the Emotion Tracker Tool.

Together, these results highlight that the Emotion Tracker was not only a practical and supportive tool but also a meaningful contributor to students' emotional engagement in their design work. The overwhelmingly positive responses suggest that integrating emotion tracking practices in design education can enhance self-awareness, encourage reflection, and inform better design decisions through emotional insight.

Although most students reported finding the tracker helpful, a minority expressed that they did not benefit from the tool. The reasons varied: some students found it difficult to analyse the information and apply it meaningfully, while others struggled to identify or label their

exact emotions, especially when experiencing multiple emotions simultaneously. A few students indicated a preference for digital formats over hard copies, and some mentioned avoiding filling out the tracker at times, particularly when they felt stuck or unsure about how to move forward.

#### 4.4.1.2 Students' Perceptions of the Emotion Tracker Tool

In response to the questions 'How did the Emotion Tracker help you?' and 'Describe how effective the Emotion Tracker tool was in helping you monitor and understand your emotions throughout the design process', students provided detailed reflections highlighting both benefits and challenges of using the tool. These responses were analysed and summarised into seven main themes that reflect their experiences with the tool (Figure 4-47). The themes include reflection on emotions and self-understanding, emotional impact on productivity and motivation, project process insight, challenges and limitations of the tool, emotional management and stress awareness, the influence of external factors, and emotional learning and growth.

Together, these categories capture the range of ways in which the tracker supported, challenged, or shaped students' emotional engagement throughout the design process.

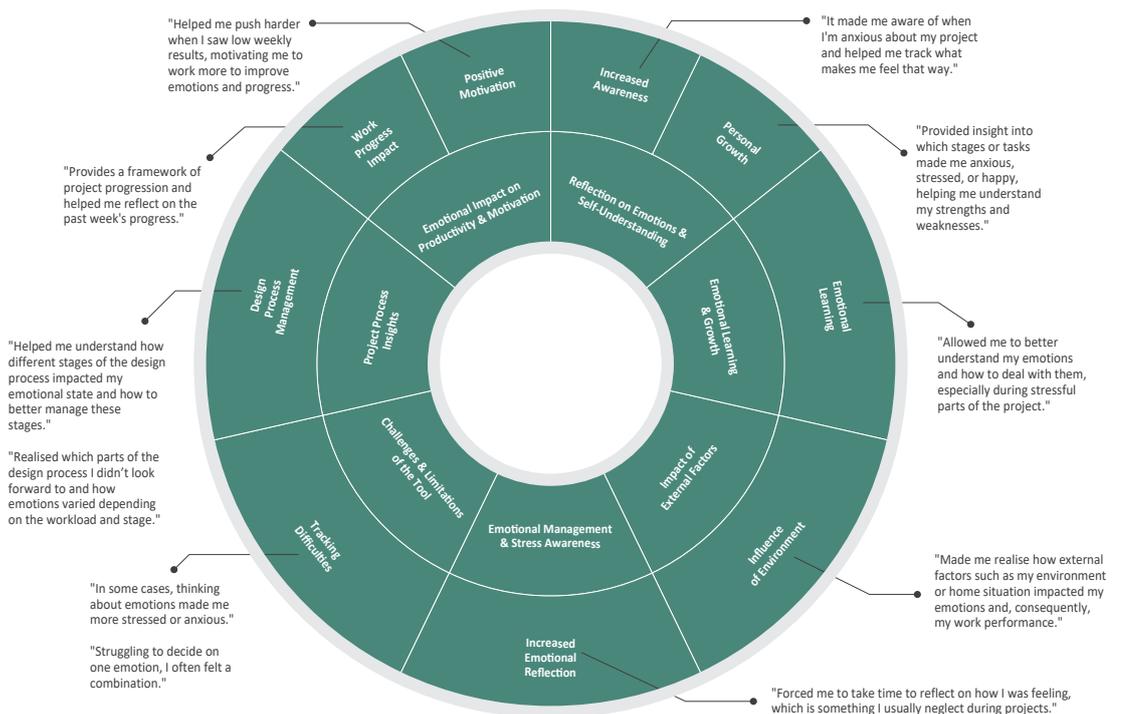


Figure 4-47. Students' Perceptions of the Emotion Tracker Tool.

First, many students highlighted how the tracker encouraged reflection on emotions and self-understanding. It helped them become more aware of their emotions throughout different stages of the design process, allowing them to identify specific triggers for stress, anxiety, or

satisfaction. This reflection supported a deeper understanding of their strengths, weaknesses, and emotional patterns, contributing to personal and emotional growth over time.

Second, the tracker was seen to influence productivity and motivation. Some students noted that observing their emotional fluctuations across weeks prompted them to take action. For instance, recognising a week of low emotion motivated them to improve their emotion and design performance the following week. In this way, the tracker served as both a reflective and motivational tool.

Third, students gained insights into the design process itself. By monitoring how their emotions changed at different project stages, they became more aware of which phases were most emotionally demanding. This helped them manage expectations and identify which parts of the process they found most difficult or rewarding.

Fourth, students also noted challenges and limitations. Some found it difficult to complete the tracker regularly or to recall emotions accurately when done infrequently. A few reported that focusing on their emotions occasionally heightened their anxiety, and that some aspects of the design experience were hard to express using the tracker format.

Fifth, the tracker promoted emotional management and stress awareness. It encouraged students to take time for emotional reflection, something many said they typically neglected during intense project work. Although this awareness didn't always lead to immediate behavioural changes, it provided valuable insight into how stress and emotions impacted their performance.

Sixth, students became more aware of the impact of external factors, such as their home environment or personal circumstances, on their emotions. Recognising these external influences helped them better understand fluctuations in their focus, motivation, and overall design output.

Finally, the tracker facilitated emotional learning and growth. Students reported gaining a better understanding of how to manage and respond to their emotions during high-pressure moments. The process of tracking emotions over time helped them reflect not only on specific experiences but also on their emotional development as designers.

In summary, while some students experienced challenges with consistency or emotional discomfort, the Emotion Tracker was largely viewed as a helpful and insightful tool that supported emotional awareness, personal reflection, and improved understanding of the emotional dimensions of the design process.

### 4.4.2 Design Process Emotions

The analysis in this section is based on five questions (see Table 3-6, 3.4.3, p.170) from the questionnaire that provide deeper insight into emotions linked to the design process, even if they are not explicitly mentioned. This was important to understand the students' perspectives on which emotions are strongly related to the design process and which are not. Accordingly, Figure 4-48 illustrates students' ratings of the emotions included in the Emotion Tracker.

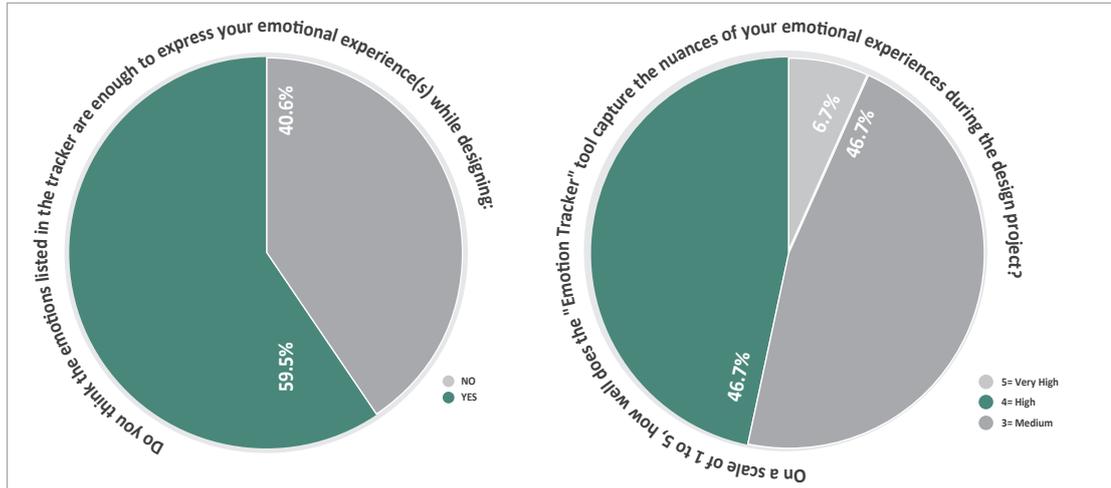


Figure 4-48. Emotion Used within the Tracker Students' Evaluation.

The left pie chart illustrates student responses to whether the emotions listed in the tracker were sufficient to express their emotional experiences while designing. According to the data, (59.5%) of students answered 'Yes', indicating that they found the tracker adequate in representing their emotions during the design process. In contrast, (40.6%) responded 'No', suggesting that a significant portion of students felt the tracker did not fully capture the range of emotions they experienced. This division highlights that while the tool was effective for the majority, there remains a need to consider a broader or more emotional range to ensure inclusivity and emotional accuracy in design reflection and the highlighting this tool limitation. Further, by using a 5-point scale, where 1 = very low and 5 = very high, the second chart explores how well the tool captured students' emotional experiences, in which responses were concentrated in the middle-to-high range. Specifically, (46.7%) of students rated the tool as 'High' and 'Medium' each. Only a small portion (6.7%), rated it as 'Very High'. The absence of ratings at the lower end of the scale suggests that students generally found the tool somewhat effective with a need for enhancement.

Moreover, Figure 4-49 presents data on students' perceptions of which emotions from the Emotion Tracker were considered irrelevant to their design process across two semesters. A higher count reflects a greater number of students who found a particular emotion less relevant, while a lower count indicates closer alignment with the emotional realities of design work.

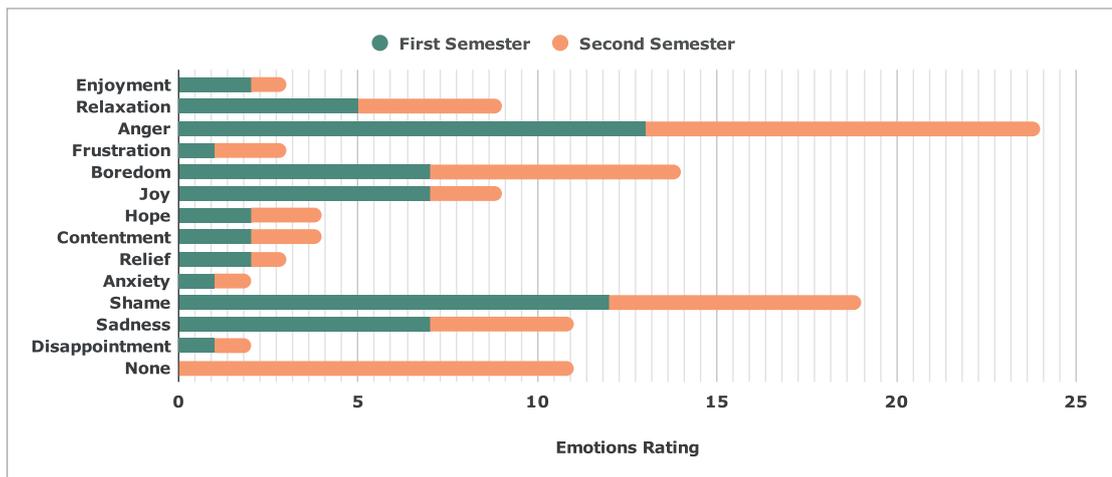


Figure 4-49. Irrelevant Emotions Rating to the Design Process.

Among all the emotions, anger was the most frequently marked as irrelevant in both semesters, 13 times in the first and 11 times in the second. Despite being a powerful and potentially productive emotional driver in human experiences (Shahsavarani & Noohi, 2015) and anger's role in creative processes as a source of engagement and curiosity (Wagner et al., 2016), anger appears to be the most contested emotion in the design studios. This may suggest a discomfort with acknowledging anger or a lack of tools and frameworks within the curriculum to process or express it productively. Shame followed closely behind, also receiving high irrelevance ratings, 12 in the first semester and 7 in the second, indicating that students may perceive it as too personal, negative, or culturally avoided (Merkin, 2023) with the nature of design learning. Some emotions showed consistent perceptions across both semesters. For instance, hope, contentment, and frustration had low and stable irrelevance ratings, suggesting that these emotions are generally understood and accepted as part of the design process. Positive emotions like joy, enjoyment, and relaxation also received relatively few irrelevance votes overall, reinforcing the idea that students tend to see these emotions as naturally integrated into design practice.

A major shift between the semesters is seen in the response to the 'none' option. In the first semester, this option was not included. It was added to the second semester's questionnaire based on student feedback, as several students expressed that all listed emotions could hold some degree of relevance depending on the context. In the second semester, 11 students selected none, indicating that they found all the listed emotions meaningful in relation to the design process. This response reflects a broader and more inclusive understanding of the emotional dimensions of design and may signal the development of greater emotional literacy and reflection over time.

Similarly, students mention other emotions, as previously highlighted (see Table 4-1, 4.3.1, p.211). These emotions can be seen in Figure 4-50. The figure presents a collection of additional emotions that students felt should be included in future versions of the Emotion Tracker to better reflect their emotional experiences during the design process. The data is

divided into two categories: emotions mentioned more than once and those mentioned only once, offering insights into both common patterns and unique individual experiences.

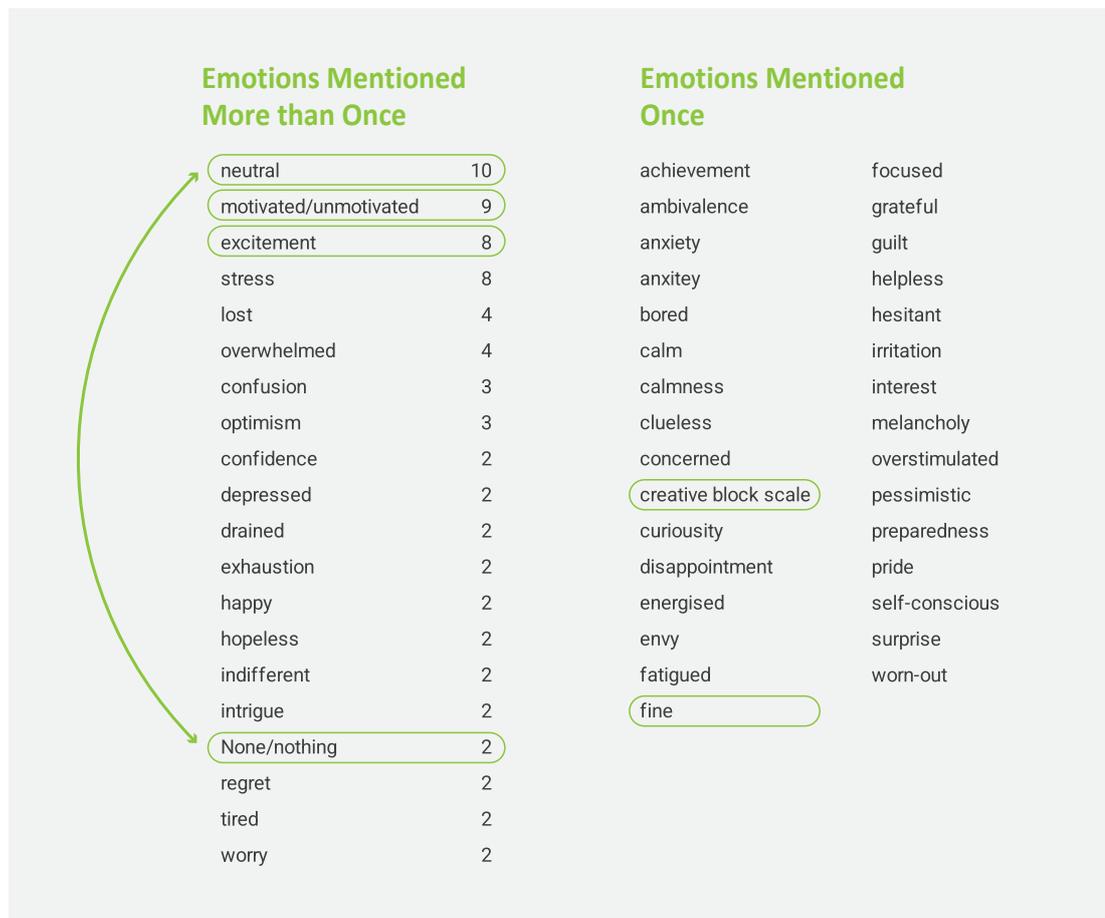


Figure 4-50. Other Emotions Identified by Students as Relevant to the Design Process.

Among the most frequently cited emotions, three stand out due to their high mention count and are highlighted in boxes: neutral mentioned (10) times, motivated/unmotivated (9) times, and excitement (8) times. The frequent mention of neutral suggests that some students experience emotions that are neither positive nor negative, indicating moments of detachment, or emotional stillness that are currently underrepresented in the tracker. Similarly, motivated/unmotivated reflects a dynamic emotional experience directly tied to students' drive and engagement levels, which are crucial during long or challenging design phases. Excitement, on the other hand, signals high-energy, positive anticipation that is often central to creative breakthroughs and ideation. Hence, excitement was consistently mentioned by students throughout both the preliminary and the main study, once again indicating its strong connection to the design process.

Also notable is the presence of 'none/nothing' which was mentioned twice, emphasising that some students experience a perceived absence of emotion during the design process. This suggests a need to recognise emotional neutrality, or what we previously highlighted as the

state of emotionlessness, not just distinct feelings, as part of the emotional spectrum. Additionally, a student mentioned 'creative block scale', which points to another form of neutrality in emotional experience. Lastly, the word 'fine' mentioned once highlights its usage to describe emotions that might mask more complex underlying feelings, another indication of how students experience and articulate their emotions in the design process.

In summary, this figure illustrates a more complex and layered emotional landscape than conventional trackers often allow. Students not only identified commonly overlooked emotions like motivation and excitement but also pointed to experiences of neutrality, emotional absence, and blockages. Incorporating these into the tracker could provide a more accurate and inclusive tool for capturing emotional experiences throughout the design journey in the future.

Consequently, Figure4-51 illustrates student responses to the question: 'What is the most emotionally challenging/difficult stage in the design process you encounter during your final design project?' Students were allowed to select more than one stage, and the responses provide insight into where students experience the greatest emotional strain.

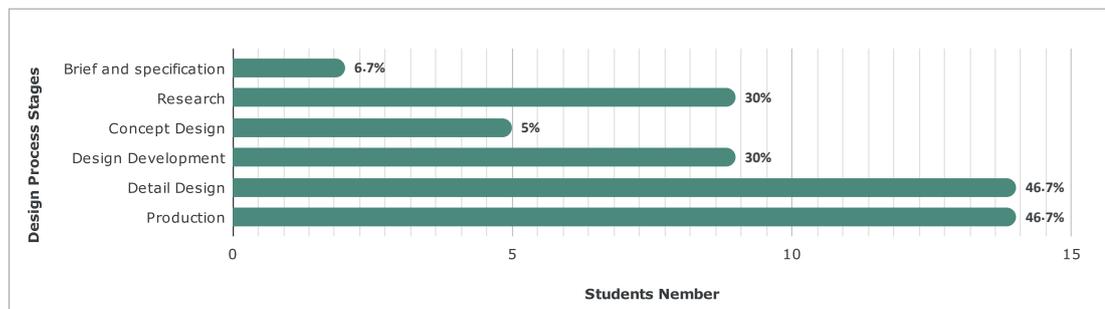


Figure4-51. Design Process: Emotionally Challenging Stages.

The most frequently cited stages were detail design and production, each selected by 14 students, which accounts for (46.7%) of the students participating in the study. These late-stage phases likely involve significant technical pressure, time constraints, and the transition from abstract ideas to tangible outcomes, which can intensify the stressful emotional experiences. The high emotional difficulty here suggests that as projects near completion, the stakes and expectations rise, contributing to greater emotional challenge. Notably, this justifies and validates the earlier findings presented in Figure 4-26 (see 4.3.2.3, pp.224), which highlight the imbalance in how the design process is distributed across the project timeline and the emotional experiences accordingly.

Both research and design development were selected by 9 students each (30%), showing that early and mid-stage activities also present notable emotional challenges. This may be due to the ambiguity and decision-making required at these stages, where students must define problems, interpret data, and begin translating research into design directions. Five students (16.7%) identified concept design, which is lower but still challenging. Only two students (6.7%) selected the brief and specification stage, indicating that this early planning phase is

generally perceived as less emotionally difficult, possibly due to its structured nature or because it lacks the intensity of later execution phases. The figure highlights that the emotional difficulty of the design process tends to increase as students move toward execution and final delivery. The findings underscore that emotional demands are highest at the end of the design process.

### 4.4.3 Factors Impacting the Design Process and the Emotional Experiences

As part of the study, it was important to consider both internal and external factors to gain a comprehensive understanding of the students' emotional experiences. Therefore, the third unit of analysis in the feedback sheet included four questions (see Table 3-6, 3.4.3, p.170) focused on identifying and rating the factors that have impact on students' design process. Students were also asked to provide examples related to the factors they selected, illustrating how these influences affected their design process.

#### 4.4.3.1 External Factors

Figure 4-52 presents the external factors rated by students that impact their emotions and in turn influence their design process, with a comparison of responses between the first and second semesters.

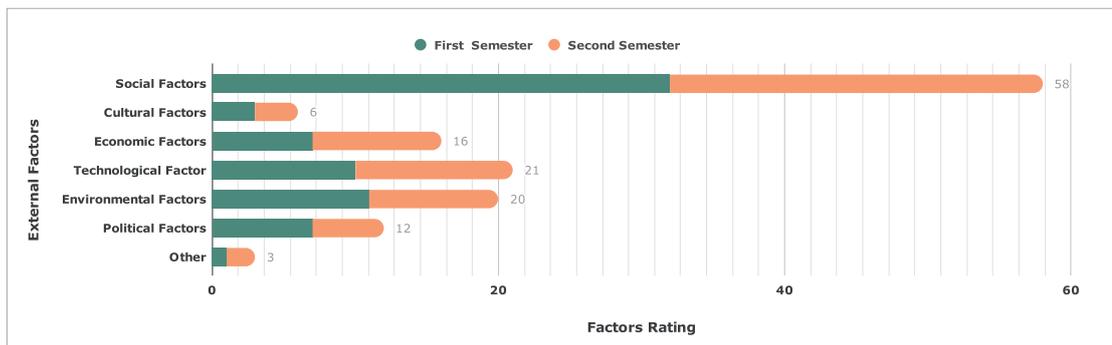


Figure 4-52. External Factors Impacting Students' Design Process Emotional Experiences.

Social factors were identified as the most influential external factor by a large margin, receiving a total of (58) ratings across both semesters, significantly higher than any other factor category. Technological and environmental factors followed, with nearly equal ratings of (21) and (20), respectively, indicating their moderate but consistent emotional influence on students. Economic factors were also noted, with a total of (16) ratings, followed by political factors, which were rated slightly lower. The cultural aspect received the fewest ratings, suggesting it had the least emotional impact on students' design processes overall. Additionally, some students mentioned other influential external factors, such as well-being and market needs, reflecting the diverse and personal nature of emotional triggers within the design context.

Social factors include influences such as family and friend issues, peer comparisons, and supervision communication. Environmental factors capture challenges related to workspaces and seasonal changes, such as noise, distractions, and winter-related mood shifts. Technological factors encompass limitations in tools and resources, as well as the pressure to adapt to emerging technologies like AI. Economic factors highlight concerns around living costs, transportation, and managing part-time jobs. Political influences include global crises and events that emotionally distract or limit academic focus. Cultural factors refer to pressures like job market demands and the impact of holidays on collaboration. Finally, wellness factors encompass both physical and mental health issues and how they hinder productivity. These examples offer a comprehensive view of the diverse external pressures shaping students' emotional engagement in the design process.

Moreover, students were asked to mention examples about these external factors, and these examples were distributed into the various factors mentioned in the feedback sheet as shown in Figure 4-53, each factor accompanied by the examples. suitability

## SOCIAL FACTORS

| Social Influence   | Interactions Influence  |
|--|---|
| <b>Social Dynamics</b><br>Family & Friend (Events, Issue).<br>Norms & Social Media Trends (Public Opinion).<br>Commitments (hobbies, Relationship).<br>Finding the right work-life balance | <b>Study Dynamics</b><br>Peer Comparing.<br>People Recruitment (effective participation, survey).<br>Supervision communication. |

## ENVIRONMENTAL FACTORS

| Space  | Weather  |
|--|--|
| <b>Working Envi.</b><br>Work environment (noise levels, distractions, feeling intimidated by certain spaces like workshops). | <b>Seasons Challenges</b><br>Seasonal depression and loss of productivity in winter months (early darkness, gloomy weather).<br>Pointless projects towards environmental crisis. |

## TECHNOLOGICAL FACTORS

| Tool Limitation   | Update Emergence  |
|---|---|
| <b>Dependency</b><br>Laptop malfunctions issues.<br>Software access and reliability.<br>Resource and material availability. | <b>New Tech</b><br>AI usage.<br>Technology knowledge and suitability.<br>Technical complexity of tasks and Design skills. |

## ECONOMIC FACTORS

| Living Cost   | Study & Work                           |
|---|--|
| <b>Cost Dynamics</b><br>Living finance and organisation.<br>Transportation.<br>Project material, tool, and prototyping. | <b>Work Dynamics</b><br>Part-time Job. |

## POLITICAL FACTORS

| External Global Crises   |
|--|
| War, humanitarian crises, and their emotional toll affecting focus on academic work.<br>Political instability and environmental crises causing feelings of futility in the project process.<br>Participation in global strikes or events affecting time available for university work. |

## CULTURAL FACTORS

| Pressure  | Occasions  |
|---|--|
| <b>Demand Dynamic</b><br>Pressure to get a job. | <b>Official Dynamic</b><br>Cultural holidays can impact the availability of resources and collaborators. |

## WELLNESS FACTORS

| Health and Well-Being   |
|---|
| Physical illness and how it delays progress on projects.<br>Mental health struggles due to overwhelming external pressures, global events, or personal crises.<br>Balancing health and well-being with project deadlines often leads to reduced productivity.<br>Procrastination and a lack of productivity can be caused by poor physical or mental health |

**EXTERNAL FACTORS**

Figure 4-53. External Factors Examples.

#### 4.4.3.2 Internal Factors

Figure 4-54 presents the internal factors rated by students that impact their emotions and, in turn, influence their design process, with a comparison of responses between the first and second semesters.

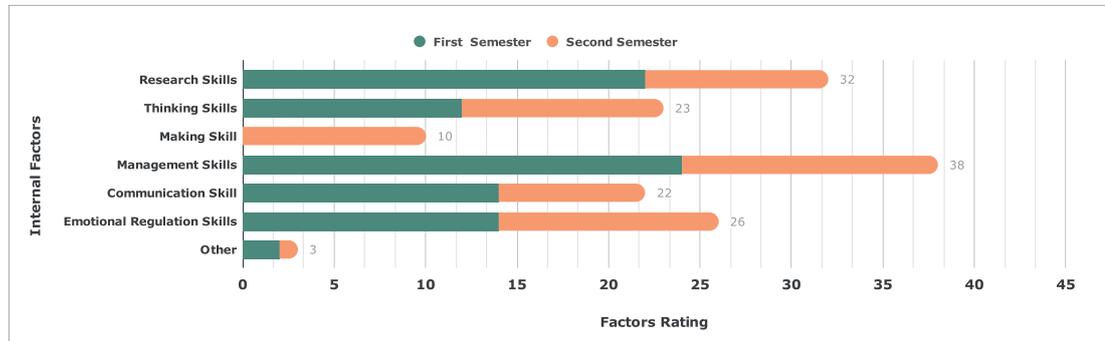


Figure 4-54. Internal Factors Impacting Students' Design Process Emotional Experiences.

Management skills emerged as the most influential internal factor across both semesters, with 38 ratings and a significant appearance during the first semester. Research skills also received a high number of ratings, though it was more prominent in the first semester, suggesting that students have less research integrated as they progress. Thinking skills and communication skills showed relatively stable ratings across both semesters, with minor differences of (23) and (22), respectively. Emotional regulation skills were also rated highly in both semesters, with 26 responses in each semester, suggesting that students face an emotional challenge in managing their emotions during the design process. This indicates a need for further support in helping students develop emotional resilience. Making skills appeared only in the second-semester data, as they were added only in that semester. This is because technical execution and prototyping were given greater emphasis during the later stages of the design project. Lastly, a few students mentioned other internal factors, such as drawing skills and creativity, as significant challenges. Although less common, these responses point to the diverse range of internal factors that students may encounter that can impact their decision-making and progress. Moreover, students were asked to explain how the factors they selected in the previous questions impacted their emotions and design process. As a result, the answers were divided into positive and negative dimensions, as indicated in the students' responses. Figure 4-55 shows each factor and both dimensions.

### RESEARCH SKILLS

| Positive  | Negative  |
|---|---|
| <p><b>Acquired Skills from Previous Modules</b></p> <p><b>Confidence</b><br/>Gained the ability to approach tasks with assurance and self-belief.</p> <p><b>Information Analysis</b><br/>Enhanced the ability to identify relevant information and develop a strong understanding of key concepts.</p> <p><b>Exploration</b><br/>Improved skills in exploring new ideas, perspectives and directions.</p> | <p><b>Emotional Frustration</b><br/>Feelings of hate, boredom, dislike, and being overwhelmed by the research.</p> <p><b>Uncertainty</b><br/>Struggling with clarity and direction.</p> <p><b>Knowledge Gaps</b><br/>Limited understanding of research methods and skills.</p> <p><b>Time-Consuming</b><br/>The research process is taking longer than anticipated.</p> <p><b>Lack of Conclusive Findings</b><br/>Findings: No specific or clear outcomes have been discovered yet.</p> |

### THINKING SKILLS

| Positive   | Negative  |
|--|---|
| <p><b>Acquired Skills from Previous Modules</b></p> <p><b>Integrating Skills</b><br/>Combining various skills to maximise their benefits.</p> <p><b>Improved Focus and Clarity</b><br/>Strengthened understanding, with a clearer sense of direction.</p> <p><b>Emotional Growth</b><br/>Enhanced emotional awareness and management.</p> <p><b>Outcome Visualization</b><br/>Developed the ability to imagine and anticipate potential results.</p> | <p><b>Rabbit Hole</b><br/>Overthinking and getting stuck in cycles of excessive thought.</p> <p><b>Creative Blocks</b><br/>• Constraints on ideas and concepts hinder the overall creative process.<br/>• Struggling with obstacles create obstacles that disrupt the flow of the creative process.</p> |

### MAKING SKILLS

| Positive  | Negative   |
|---|--|
| <p><b>Acquired Skills from Previous Modules</b></p> <p><b>Prototyping</b><br/>Improved the process through trial and error.</p> | <p><b>Disconnect between sketches and practical application.</b></p> <p><b>Knowledge Gaps</b><br/>Limited experience with software, techniques, materials, and mechanisms.</p> |

### MANAGEMENT SKILLS

| Positive  | Negative   |
|---|--|
| <p><b>Stay on track</b><br/>Maintain focus and manage risks effectively, efficient task focus.</p> <p><b>Breaks</b><br/>Take sufficient breaks to sustain momentum.</p> <p><b>Planning</b><br/>Balance workload with project timelines.</p> | <p><b>Time</b><br/>• Rushing through tasks with a last-minute approach.<br/>• Tight project timelines.<br/>• Prioritisation challenges.</p> <p><b>Emotional Impact</b><br/>Increased emotional stress.</p> <p><b>Workload Challenge</b><br/>• Overwhelming workload.<br/>• Project time scale and deadlines.<br/>• Procrastination.<br/>• Late Submission.</p> |

### COMMUNICATION SKILLS

| Positive   | Negative  |
|--|---|
| <p><b>Stakeholders</b><br/>• Engaging in effective communication with stakeholders.<br/>• Gathering feedback through meetings, interviews, and surveys.<br/>• Building and maintaining strong relationships with stakeholders.</p> <p><b>Leadership &amp; Supervision</b><br/>• Supervising relationships.<br/>• Personal Development.</p> | <p><b>Communication Challenges</b><br/>Ineffective communication leading to inaccurate data gathering.</p> <p><b>Presentation Skills</b><br/>Struggling with presenting information clearly and effectively.</p> <p><b>Emotional Frustration</b><br/>Negatively impacting the quality of communication.</p> |

### EMOTIONAL REGULATION SKILLS

| Positive  | Negative  |
|---|---|
| <p><b>Thriving Under Pressure</b><br/>Excelling in high-pressure situations.</p> <p><b>Emotional Management</b><br/>Using writing as a tool to process and manage emotions more effectively.</p> <p><b>Personal Growth</b><br/>Focusing on personal development and improving overall personality traits.</p> | <p><b>Emotional Regulation Challenges</b><br/>• Challenges in regulating emotions, leading to delays or lack of motivation and hindering productivity.<br/>• Emotional struggles, such as stress and frustration, affecting focus and work.<br/>• Struggling to isolate emotions from the project, affecting work performance.<br/>• Sensitivity to setbacks and comparison with others.</p> <p><b>Impact of Negative Emotions</b><br/>• Tendency to shut down or become unproductive when facing negative emotions.<br/>• Challenges in controlling emotions, affecting overall work quality.<br/>• Emotional personality influencing responses in stressful situations.</p> <p><b>Emotional Awareness</b><br/>Difficulty identifying and understanding personal emotions<br/>Inability to assist others in managing their emotions effectively.</p> |

## INTERNAL FACTORS

Figure 4-55. Internal Factors Detailed Explanations.

In research skills, positive experiences include gaining confidence, improved exploration, and enhanced information analysis. Negatively, students reported emotional frustration, uncertainty, knowledge gaps, time-consuming research, and inconclusive findings. For thinking skills, positives include integrating skills, improved clarity, emotional growth, and outcome visualisation. Negative experiences highlight overthinking "*rabbit hole*", creative blocks, and struggles with obstacles disrupting the creative flow. Making skills positives relate to skills acquired from previous modules and improved prototyping through trial and error. Negatives include a disconnect between sketches and application, as well as knowledge gaps in tools, techniques, and materials. In management skills, students positively experienced staying on track, taking breaks, and effective planning. However, they also faced time pressure, emotional stress, overwhelming workload, procrastination, and late submissions. Communication skills were positively associated with effective stakeholder engagement, feedback collection, supervision, and personal development. Negatives involved challenges in communication, poor presentation clarity, and emotional frustration. Lastly, emotional regulation skills saw positives in thriving under pressure, emotional management, and personal growth. Negatives included difficulty regulating emotions, frustration, emotional sensitivity, difficulty isolating emotions from work, and poor emotional awareness

Positive aspects highlight the benefits students gained, such as confidence, emotional growth, improved focus, effective stakeholder communication, and thriving under pressure. These contributions reflect the development of both technical and soft skills through the design process. The negative aspects on the other hand, illustrate emotional and cognitive challenges. These include emotional frustration, overthinking, lack of practical application, time pressure, communication difficulties, and problems regulating emotions. Students also reported struggles like creative blocks, uncertainty in research, and emotional impacts from workload or performance comparisons.

Accordingly, students were also encouraged to share a significant moment or event during their project that had a notable emotional impact, whether positive or negative, throughout the course of the project. The results are presented in Figure 4-56.

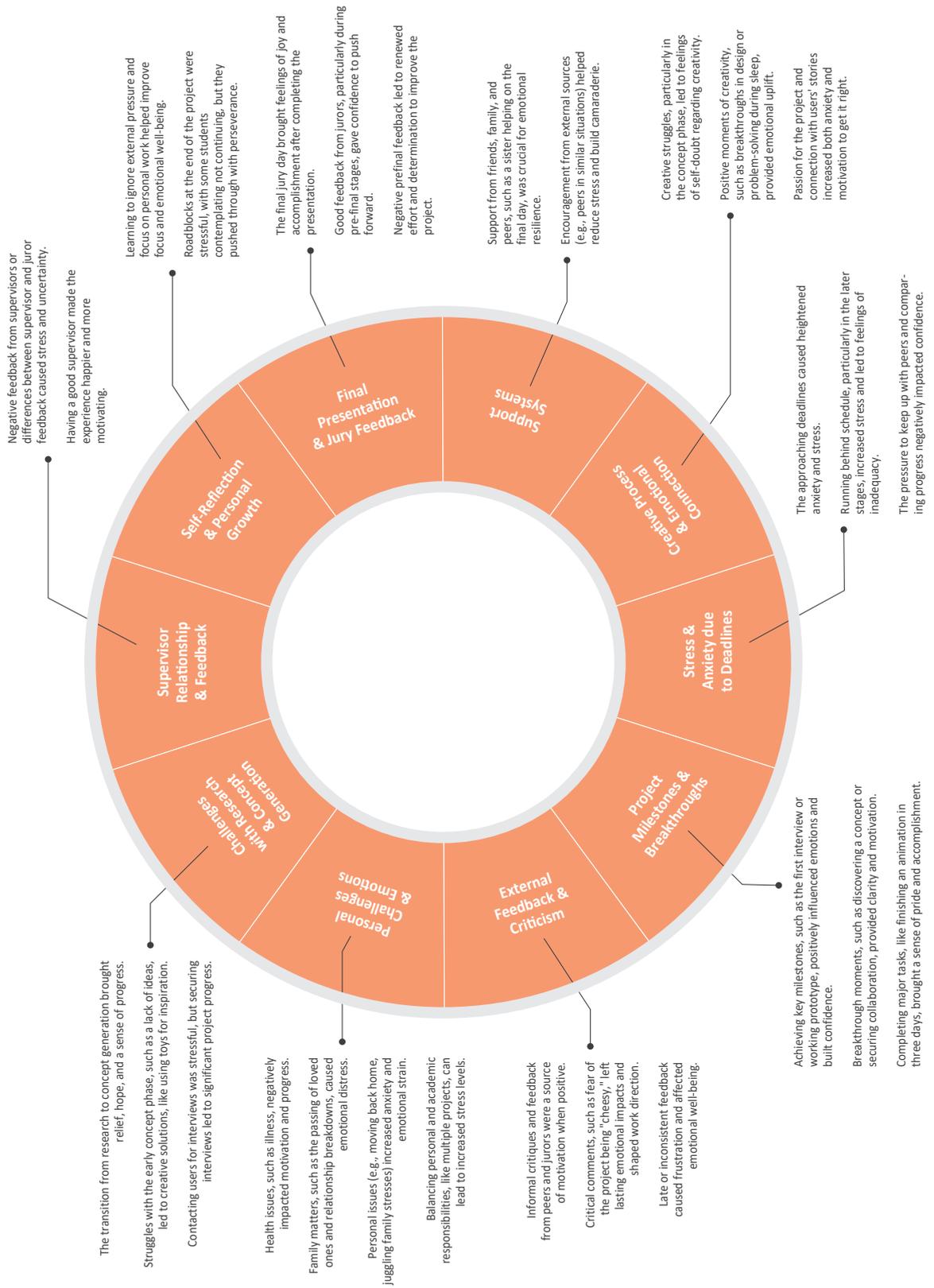


Figure 4-56. Students' Overall Factors Themes.

Students shared a range of significant moments that emotionally impacted them throughout their design projects. One major theme was the relationship with supervisors and feedback (Chugh et al., 2022; Shang et al., 2024), where positive support and constructive criticism boosted confidence, while conflicting or harsh feedback caused stress. Research and concept generation phases also played a crucial emotional role where moments of progress offered relief and motivation, while struggles with ideation and user contact introduced stress but sometimes led to creative breakthroughs. Personal challenges, including illness, family issues, and balancing responsibilities, added emotional strain and anxiety. External feedback, particularly from peers and jurors, influenced emotions; while encouraging comments motivated students, negative or inconsistent feedback caused frustration. Reaching project milestones, like securing interviews or completing a prototype, uplifted students and gave them a sense of achievement. However, deadlines, especially in later stages, brought intense stress and self-doubt, often worsened by comparisons with peers. The creative process itself was emotionally charged, with struggles affecting confidence and moments of inspiration offering emotional highs. Support systems, including friends, family, and peers, proved essential for resilience. The final presentation and jury feedback were emotionally significant, offering both pride and motivation. Lastly, students experienced personal growth, learning to manage external pressures, reflect on their progress, and persist despite roadblocks.

#### 4.4.4 Emotion State Definition

As discussed in the significant results from the Emotion Tracker (see 4.2.4, pp.208), a new emotional phenomenon emerged during the study, which is termed the Emotionlessness State. Students reported feeling no emotion during certain unexpected stages and moments in the design process. To better understand this state, a fourth section (see Table 3-6, 3.4.3, p.170) was added to the Feedback Sheet during the second semester. This section specifically aimed at clarifying the meaning of the Emotionlessness State and determining how many students experienced it. Figure 4-57 confirms that students did, in fact, experience this state, with (63.3%) reporting being in this state, which is more than half of the students.

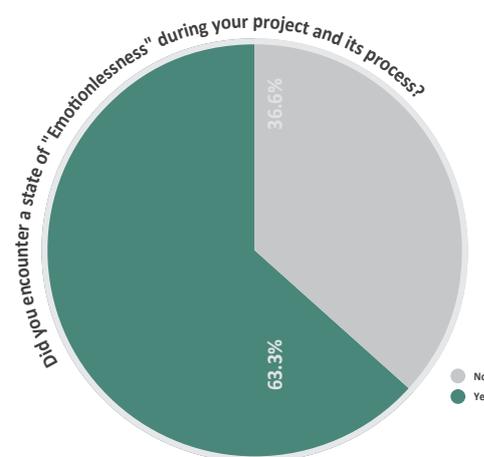


Figure 4-57. Students Encounter Emotionlessness State.

When asked to define this state, students provided a range of responses. However, to understand what this state means from the design students' perspective, the students were first asked to identify words that are closely associated with this state. As shown in Figure 4-58, students most frequently linked the Emotionlessness State to neutrality and numbness, both cited equally. These were followed by emptiness and nothingness.

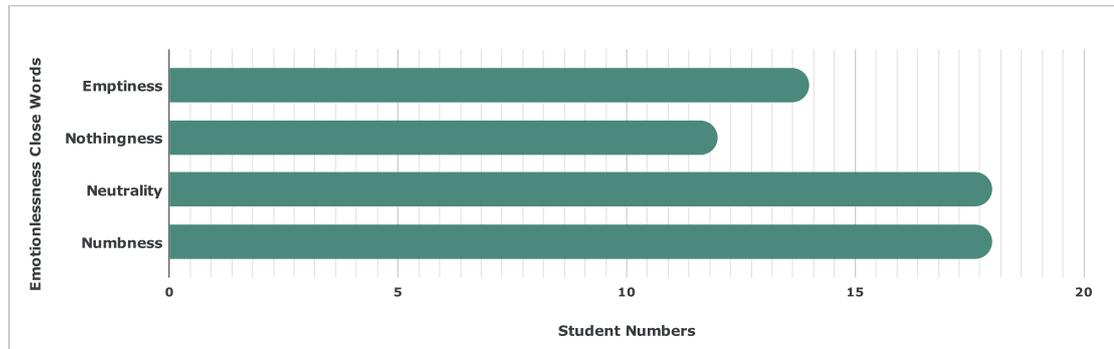


Figure 4-58. Emotionlessness: Closest Words.

Based on the students' entries and reflections related to this particular state, the data revealed recurring patterns and shared expressions that pointed toward a distinct emotional state experienced during the design process. These insights informed the development of a collective definition grounded in their perspectives. Accordingly, this research proposes the following definition:

Emotionlessness in the design process is a state of detachment where students experience a lack of emotional connection, motivation, or investment in their work. This state is characterised by an absence of positive or negative feelings towards a specific stage or part in the process, resulting in a sense of numbness or neutral-like engagement. This state often manifests as disinterest, lack of care for project/outcomes, and an inability to assess the quality of one's work. Emotionlessness can arise from burnout, boredom, or repetitive exposure to a project, leading to a perception of working mechanically without passion or purpose. It may also arise from a sense of satisfaction with the current situation, leading to no perceived need for further effort. It may also reflect a neutral or functional approach, where emotional expression is minimal, and the focus shifts to completing tasks rather than engaging with them meaningfully.

## 4.5 The Semi-Structured Interview Results

To support the interpretation of the Emotions Tracker and Feedback Sheet results, Semi-Structured Interviews were conducted with students who participated in the study. This qualitative methods approach provides a more comprehensive understanding of design students' emotional experiences by contextualising the data gathered through the cultural probe and the questionnaires. The interviews were a complementary part of the research, yet, important and were conducted on an availability basis after the project was completed and the results and marks was shared with all students. The interviews aimed to support the following research questions:

### **RQ1. What emotional experiences do design students encounter throughout the design process?**

*RQ1.6. What is the meaning of emotions from the design students' perspectives?*

### **RQ2. How do the design students' emotional experiences affect their design process?**

*RQ2.1. What are the relationships between students' emotions and their design process stages?*

*R.Q2.3. What are the factors impacting students' design process?*

### **RQ3. How can the emotions of design students be effectively incorporated into their design process journey?**

*RQ3.1. What is the usability and reliability of emotion tracking tools during the design process?*

*RQ3.2. How can we promote the employment of emotion in design education?*

These interviews helped the researcher gain insight into the emotions students experienced during various stages of the design process, the reasons behind these emotions, and the extent to which they influenced or motivated their design processes and decisions. Fully structured interviews did not seem necessary, as the questionnaire served as a structured framework that could be further discussed and explored in individual conversations with the students. The interviews included questions aimed at identifying the significance of emotions that appeared most frequently or new phenomena that arose, asking students to clarify how they understood and defined those emotions. Discussions also explored how students' emotions affected their decision-making regarding their design process, either by facilitating progress or causing delays.

Additionally, students were asked to reflect on their experiences, which in turn helped create connections between different emotions during the analysis phase, such as the relationship between being in a neutral emotional experience and experiencing emotional detachment or emotionlessness. Data from these semi-structured interviews was recorded and transcribed, then analysed using a coding schema. This schema was evaluated with input from experienced designers, who provided feedback on the appropriateness and relevance of the

codes. The resulting analysis led to the development of themes and categories related to emotion and the design process.

A three-step process guided the analysis of the interviews. First, emotional experiences data were gathered through 15 interview questions. Second, a coding schema was developed and validated in collaboration with designers from education and practice areas. Third, emotional definitions and networks were constructed to explain how design students experienced and processed emotions throughout their design project using appropriate tools (Table 4-4).

Table 4-4. Interview Analysis Structure Summary.

| Step                         | Description  | Purpose  |
|------------------------------|--|--|
| 1. Data Collection           | 15 core questions asked in semi-structured interviews with 13 students post-project (see 4.5.1, pp.265).             | To gather qualitative data on students' emotional experiences during the design process. |
| 2. Coding Schema Development | Development and validation of coding schema with input from designer in the field. (see 4.5.2, pp.267).              | To analyse emotional data using grounded theory approach.                                |
| 3. Data Analysis & Results   | Construction of emotional networks and visualisation to explain students' emotional experiences (see 4.5.3, pp.269). | To contextualise emotions and their relationships in the design process                  |

#### 4.5.1 Interview Data Collection and Transcription

Thirteen in-depth interviews were conducted face-to-face and online with students from two academic departments: the Department of Design and Visual Communication at the German Jordanian University and the Department of Design, Manufacturing, and Engineering Management at the University of Strathclyde. Table 4-5 provides a detailed overview of the students. Notably, participation in the interviews was voluntary, and a higher number of female students chose to take part compared to male students.

Table 4-5. An Overview of Interview Student Participants.

| Number of Students by Country and Gender |      |        |      |
|--|------|--------|------|
| Scotland                                 |      | Jordan |      |
| Female                                   | Male | Female | Male |
| 6  | 1    | 6      | 0    |
| 7  |      | 6      |      |
| <b>Sum: 13 (12 females, 1 male)</b>      |      |        |      |

This imbalance may be attributed to existing research suggesting that female are generally more open to discussing their emotions and tend to be more expressive in emotional contexts (Kring & Gordon, 1998) with a broader emotional vocabulary that can be called in shorter time (Bauer et al., 2003; Vainik, 2006). Therefore, the emotional insights gathered in this study may reflect this greater willingness among female participants to engage in such conversations.

Students were selected through purposive sampling (Ahmad & Wilkins, 2025; Clark et al., 2021; Tajik et al., 2025) to ensure that the interviews included students who had participated in the Emotion Tracker study, with equal representation of final-year (fifth-year) students from both institutions. The interviews followed a semi-structured format designed to prompt students to reflect on their emotional experiences throughout the design process, as well as on their experiences of participating in the tracking study. Each interview lasted approximately 25 to 45 minutes. All interviews were audio recorded and subsequently transcribed, along with consent forms completed and signed by all participating students (Figure 4-59).



Figure 4-59. Face-To-Face Interview Setting.

The number of interviews was informed by guidelines on theoretical saturation. Guest et al. (2006) emphasise that saturation, the point at which no new themes emerge, is the key criterion for determining sample sizes in purposive research. While Bernard (2000) suggested a sample size of around 36 participants, Guest et al. (2006) found that thematic saturation can often be reached with as few as 12 interviews. In this study, noticeable variations in code frequency began to stabilise within 10 interviews. However, to ensure balanced representation from both institutions, 13 interviews were conducted. This number was sufficient to achieve the saturation and provided a robust data set for analysis. Interview transcriptions were facilitated by Otter.ai, an AI-powered transcription platform that automatically converts speech to text. Audio recordings were captured using the Voice Memos app on an Apple phone and then transferred to Otter.ai for transcription. The researcher carefully reviewed the transcriptions for accuracy and made corrections and edits where necessary. Hence, transcribing the interviews was essential for engaging with the content, enabling data interpretation (e.g., highlighting, note-taking, open coding), ensuring research transparency, supporting data reduction, and providing a traceable archive for analysis. The transcribed interview texts serve as a reference point for tracking information used in the analysis.

## 4.5.2 Data Coding Structure and Process

The data analysis was conducted using the qualitative research software Atlas.ti (<https://atlasti.com/>). The coding process followed three main stages (Figure 4-60) and was guided by the grounded theory methodology originally developed by Barney G. Glaser and Anselm L. Strauss (Glaser & Strauss, 1967).

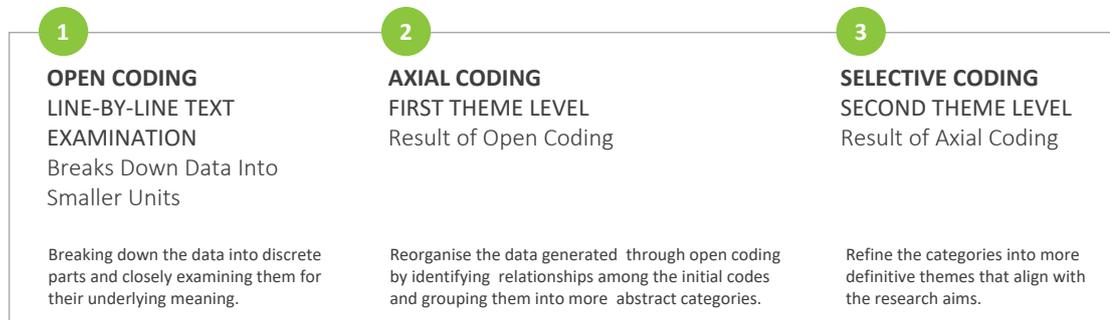


Figure 4-60. Coding Analysis Process.

Grounded theory is especially well-suited for studying human behaviour in relation to sensitive topics, even across diverse cultural contexts (Wolcott, 1985). This approach is particularly valuable in exploratory research where the goal is to understand individuals' experiences, how they perceive those experiences, and the actions they take as a result. Although this research employs grounded theory as an analytical framework, its purpose is not to develop a new theory. Instead, the aim is to generate definitions for emerging phenomena and gain a deeper understanding of the emotional experiences of design students during the design process. Additionally, the analysis aims to identify patterns, relationships, and networks across various emotions. This approach supports and justifies the research focus on specific results and outcomes.

As a result, once the interview transcripts were prepared, open coding was applied to aid in identifying the first-level themes emerging directly from the data. This step involves breaking down the data to examine, compare, conceptualise, and categorise it (Corbin & Strauss, 2008). As a result, students' accounts of their emotional experiences during the design process were inductively broken down into smaller units of words (codes), as the researcher closely examined the data to identify recurring patterns and insights. This was followed by axial coding, whereby data are combined in new ways after open coding (Corbin & Strauss, 2008). Axial coding enabled the development of second-level themes aligned with the analytical categories of units that informed the interview questions (see 3.4.4, pp.173). Finally, selective coding was conducted to develop a unified understanding of the emotional landscape, identifying core themes that connect all other categories. Figure 4-61 illustrates the coding schema derived from the interview data, which is the basis for the discussion in the following section. These code detailed distribution can be found in Appendix 7, p.423.

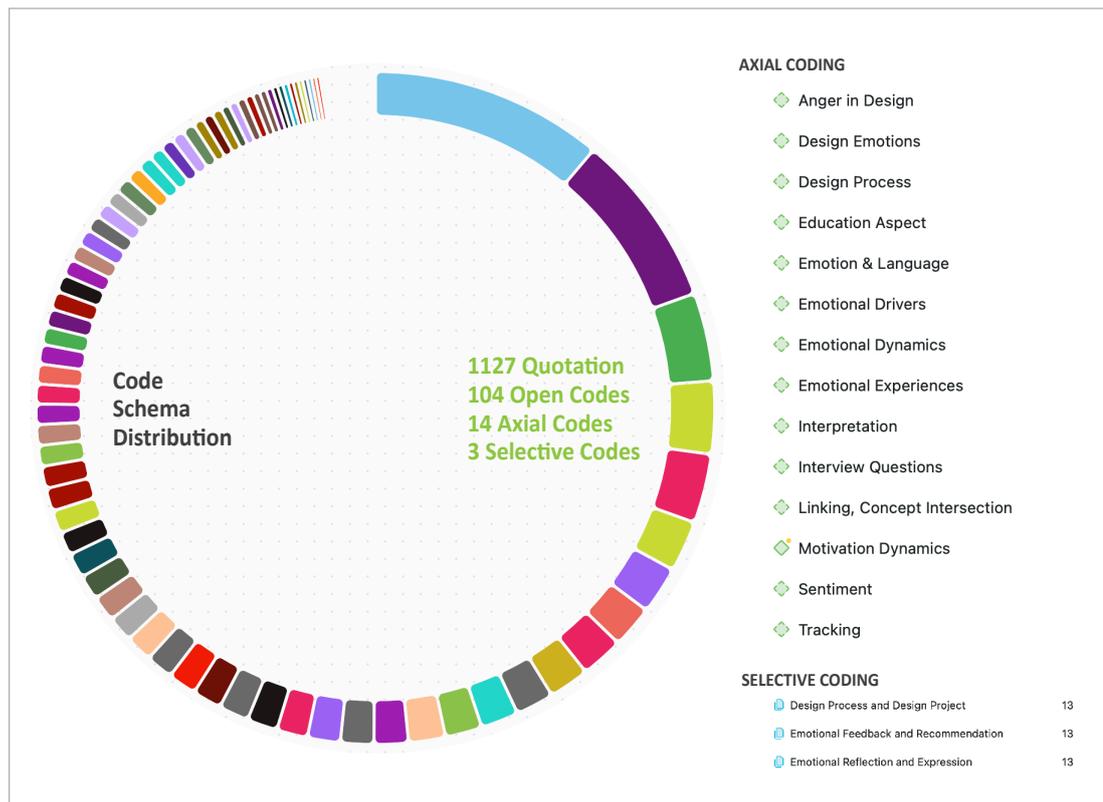


Figure 4-61. Coding Schema Overview.

The circular diagram illustrates the distribution and frequency of the axial and open codes. Accordingly, Figure 4-61 a total of 1,127 quotations were extracted and 104 open codes were created. These open codes were then grouped into 14 axial codes that reflect broader conceptual categories including but not limited to anger in design, emotional drivers, design process, motivation dynamics, etc. In the final stage, these categories were refined into three selective codes: design process and design project, emotional feedback and recommendation, and emotional reflection and expression (see Appendix 8, p.424), each of which is directly aligned with the study's research aims. This structured coding process enabled a deeper understanding of the emotional dynamics within design education and provided a foundation for the findings and discussion in later chapters.

To ensure transparency and rigour throughout the open coding process and subsequent stages, discussions were held with design tutors and practitioner experts. These consultations helped validate the appropriateness of the coding and categorisation, ensuring that the emerging themes accurately reflected the data. Hence, all the interviews were stored in Atlas.ai and organised based on the students' interview date, and anonymised by assigning a sequential number based on the date the interview took place. In addition, quotes derived are cited using a data reduction that includes the student number as (S#), question number, and the timestamp from the audio file (e.g., S1:Q3, 20:02). An example of reference-coded data is provided in Table 4-6. All statements and codes were extracted and compiled into an Excel spreadsheet. The Appendix includes extracted students state samples corresponding to one of the axial codes (Appendix 9, p.425).

Table 4-6. Sample of Entries from Student Interviews.

| Transcript References | Students' Statement Example   |
|-----------------------|---|
| S2:Q3, 08:04          | <i>"I'm frustrated with the project or my progress, but I wouldn't say I'm angry with the project, you know, or angry with myself."</i>                       |
| S8:Q2, 06:44          | <i>"It's when I don't feel positive feelings, nor I feel negative feelings. I feel almost numb."</i>  |
| S1:Q5, 25:10          | <i>"I think contentment for me was like, someone would say, Fine"</i>   |
| S11:Q8, 21:25         | <i>"I realised that without those things, without the setbacks, maybe I wouldn't have done the project the way that I did it, which I'm really proud of."</i> |

### 4.5.3 Data Coding Analysis Results

The interview aims to gain a deeper understanding of the emotional experiences students went through, expanding on the analysis gained from the previous two methods. This section will be organised according to the three themes identified through selective coding to present the results and outcomes of the analysis and reveal in detail the patterns illustrated under each one. Accordingly, the data was visualised through network graphics and data visualisation to identify connections across various aspects of the emotional experiences and the design process expressed by students.

#### 4.5.3.1 Emotional Reflection and Expression

This part of the analysis explores students reflecting on their expressed emotions throughout the design process tracking study. Mapping emotional connections and networks reveals how different emotions interact with each other and with key moments in the students' journey. These visualisations offer insight into the interpretations and progression of their emotional experiences.

Figure 4-62 illustrates emotions students mentioned during the interview and provides the relationship to two key contexts: the design process and project work, and the emotional reflection and expression. The visual highlights once again how emotions such as contentment, 'fine', were more prominently linked to the design process, indicating that these feelings often arose in response to practical engagement with design tasks and peer comparison. These emotions also emerged during the emotion tracking and the questionnaires, highlighting their close connection to the design process, as emotional responses were often felt directly within students' design projects.

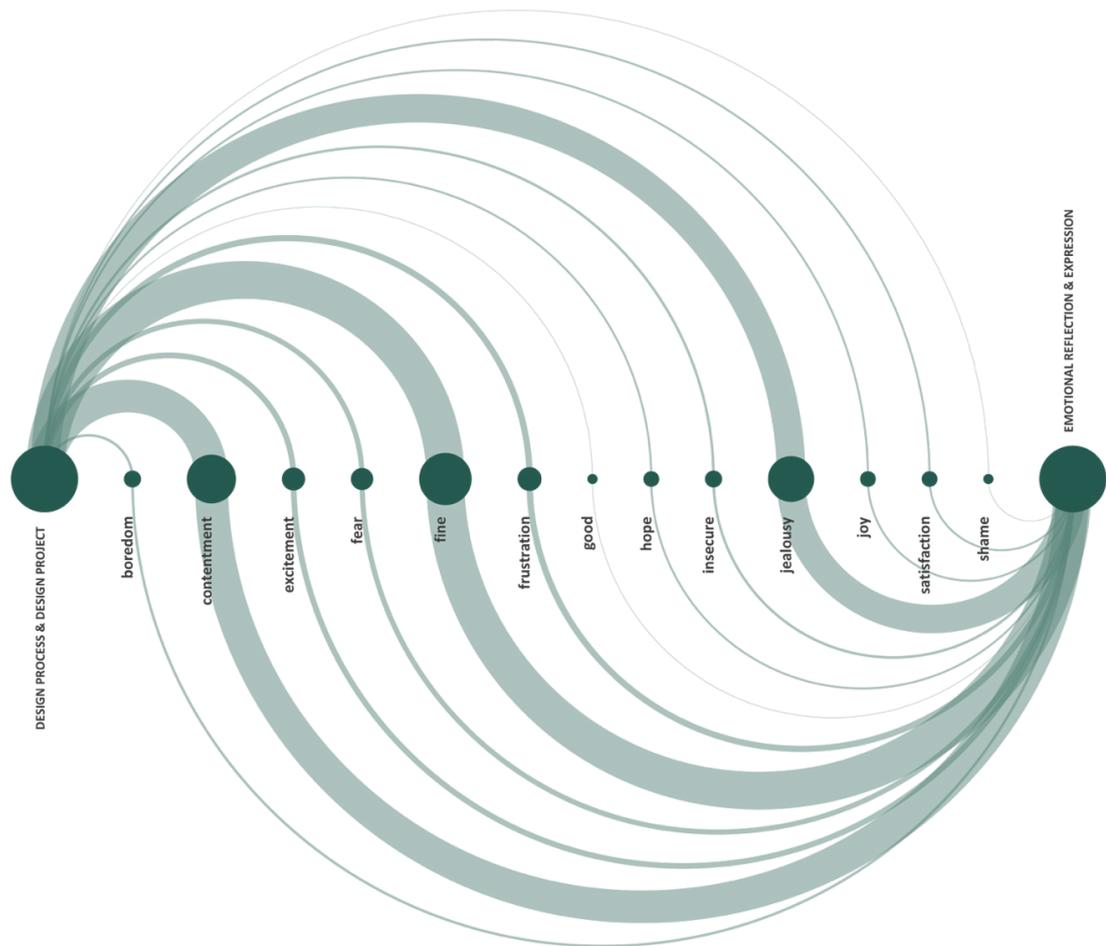


Figure 4-62. Emotions Mentioned during the Interview.

In addition, emotions such as excitement and satisfaction also appeared in relation to the design process, though not as prominently as contentment and 'fine'. This suggests that while moments of positive engagement were present, they were less frequently emphasised by students compared to neutral emotions. In contrast, shame, insecurity, and jealousy were more frequently associated with the reflective process, suggesting that when students had the opportunity to pause, reflect, and talk about their experiences they were more likely to reveal or become aware of more profound and more sensitive emotions which might not have been obvious during the actual design process. Hence, in this context, jealousy was presented as a productive emotion, one that motivated students to push themselves and strive for improvement, as expressed by S3:Q4,14.29 *"It makes me want to do better in myself. It's like a motivational rather than a negative."* and S6:Q4,14.19 stated *"when it comes to the design, it's good to be jealous so that you can be better, not envious."*

However, the previous results directly draws attention to two important emotions that consistently appeared across all tools: contentment and the word 'fine'. When students were asked about the meaning of these experiences, it became clear that they are closely connected and share common ground. Despite their general tone, students described both as neutral emotions. They agreed these feelings were common and frequently experienced throughout the design process (Figure 4-63).

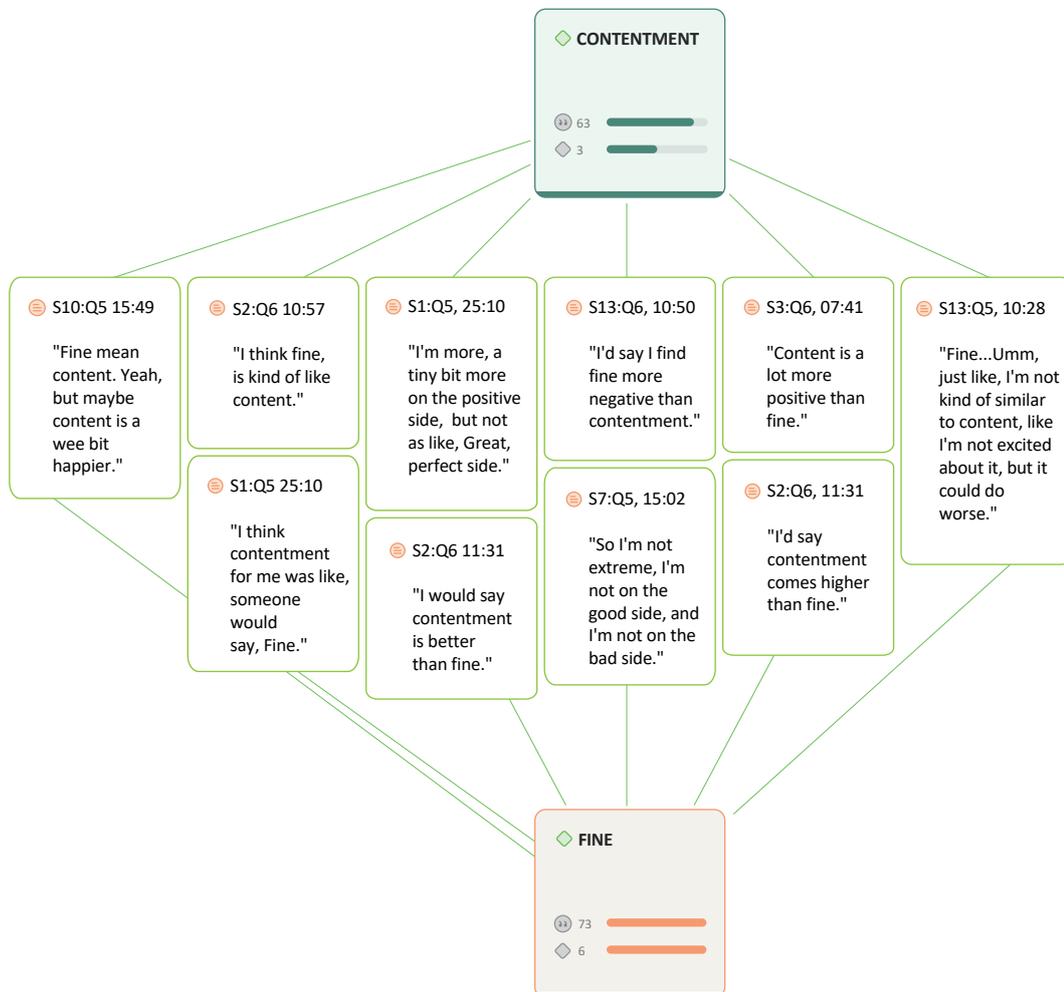


Figure 4-63. Students' Reflections: The Relationship between Contentment and 'Fine'.

Despite the fact that contentment and 'fine' share similar characteristics, as both reflect a neutral experience, students clearly stated that while contentment is a neutral emotion leaning toward the positive side of the experience, feeling 'fine' is also neutral but leans slightly toward the negative side during the design process. Building on this, the interviews revealed another emotional pattern: contentment was often associated with satisfaction, reinforcing its subtle alignment with positive experiences.

Given that, Figure 4-64 illustrates how students defined and described the emotion of contentment, revealing its close connection to the feeling of satisfaction. As stated by student S13:Q5 15:02, "Just sort of being like satisfaction, like not being like overly happy, but not being disappointed, just some a perfect middle point between the two."

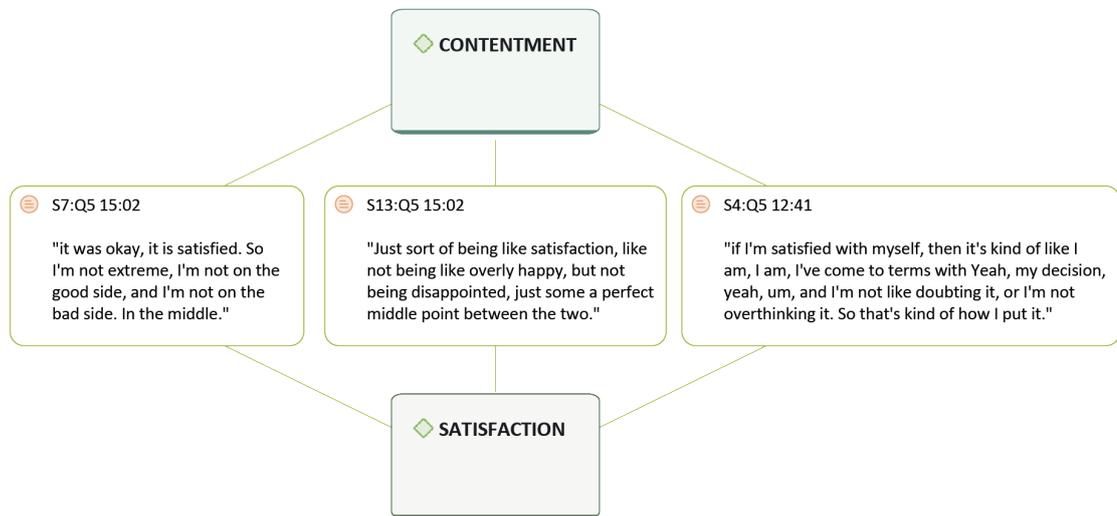


Figure 4-64. Students' Reflections: The Relationship between Contentment and Satisfaction.

In addition, Figure 4-65 based on students' perspectives, describes contentment as a neutral-positive emotion, characterised as stable and calm. Thus, satisfaction was clearly identified as a distinctly positive emotion, often associated with achievement or closure.

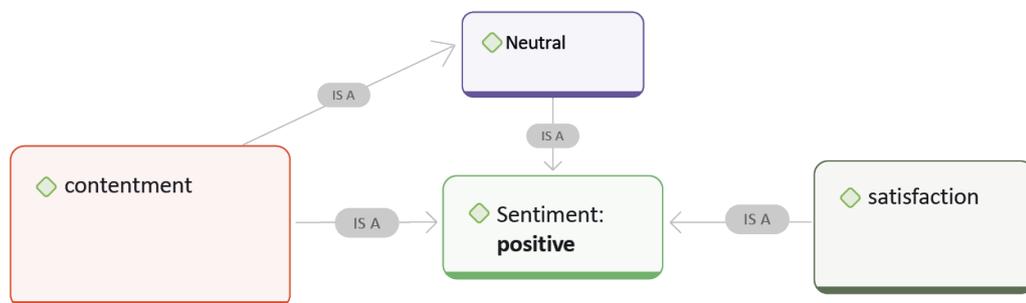


Figure 4-65. Contentment and Satisfaction: Networks and Connections.

In contrast, feeling 'fine' was often associated with concepts such as escape, routine, and a lack of care, as one of the students expressed, *"I was never like, I don't care about this, and I think that's what fine."* S10:Q6, 16:15. Students described 'fine' as a response to repetitive tasks or a stagnant phase in the design process, where boredom began to emerge. This experience sometimes led to procrastination or staying too long in one stage of the project, ultimately resulting in a sense of being 'fine', not out of contentment, but from disengagement (Figure 4-66). S11:Q2, 07:38 stated *"Maybe routine like boring being in a boring routine, maybe not focusing on the moment again, or maybe not looking forward to the future and exciting yourself, maybe we start feeling that there is no point, and maybe it doesn't matter."*

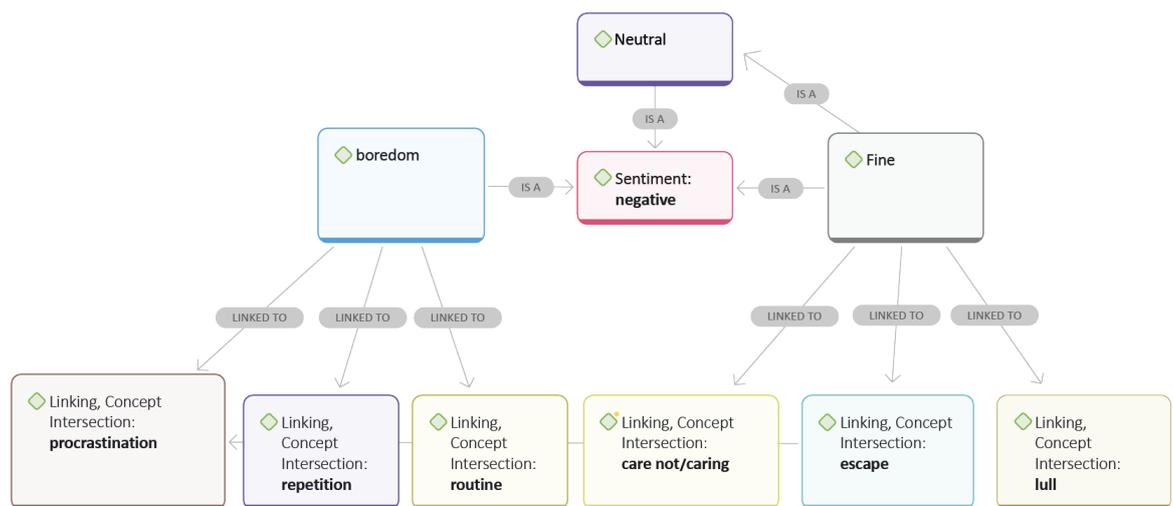


Figure 4-66. 'Fine' and Boredom: Linking and Concept Intersections.

However, the connections between the four emotions, contentment, satisfaction, 'fine', and boredom, also reveal a direct link to the state of emotionlessness discussed earlier (see 4.2.4, pp.208 and 4.4.4, pp.262). Figure 4-67 illustrates this connection, which was derived from students' reflections when they were asked to elaborate on the reasons behind experiencing an Emotionlessness State and which emotions they felt were related to it. Figure 4-67 brings together the emotional nodes previously presented in Figure 4-65 and Figure 4-66, forming a new continuum that captures the emerging emotional elements associated with emotionlessness.

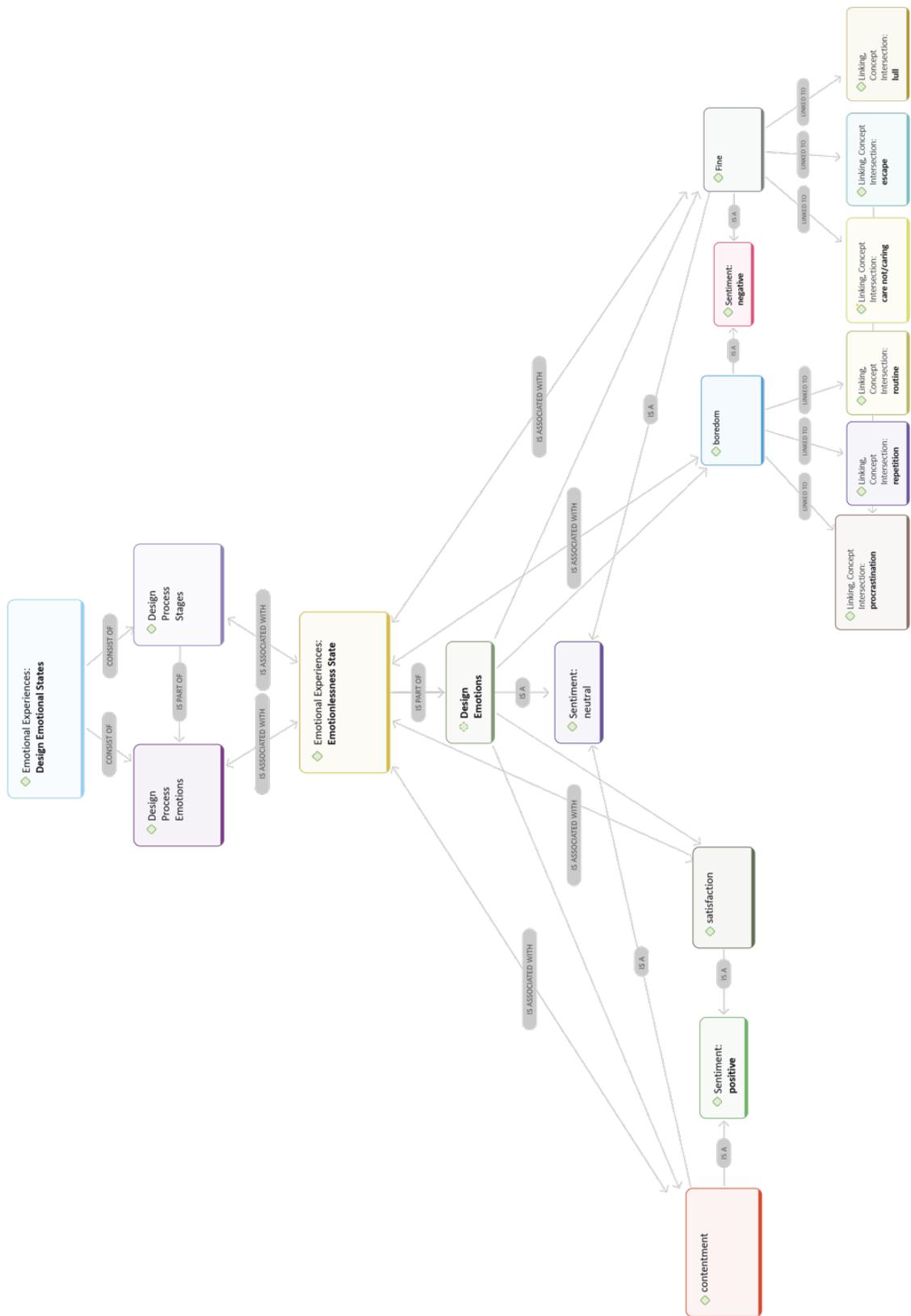


Figure 4-67. Emotionlessness: Emotional Networks and Connections.

Consequently, Figure 4-68 shows a representation of how the state of emotionlessness in the design process emerges as an absence of emotion with a gradual shift along an emotional continuum. Emotionlessness, as defined, is a state of detachment in which individuals feel a lack of emotional connection, motivation, or investment in their design work (see 4.4.4, pp. 262). This state can stem from both positive and negative starting points. On one side, students may begin with the positive emotion of satisfaction, which, over time and through the stabilising effect of comfort, can shift into contentment. On the other hand, students may enter the process feeling bored due to repetition, which can eventually transition into the emotionally flat experience of being 'fine'. Despite originating from different emotional points, both contentment and 'fine' converge as neutral experiences. When students reach these points, the emotional engagement with their projects tends to fade, often leading to a phase of disengagement. The figure below highlights this convergence by mapping the associations between satisfaction, contentment, boredom, and 'fine', showing how emotionlessness phenomenon can emerge from emotional quietness stages to neutral stage. Ultimately, this state manifests as working mechanically, without passion, reflection, or a meaningful connection to the design task at hand.

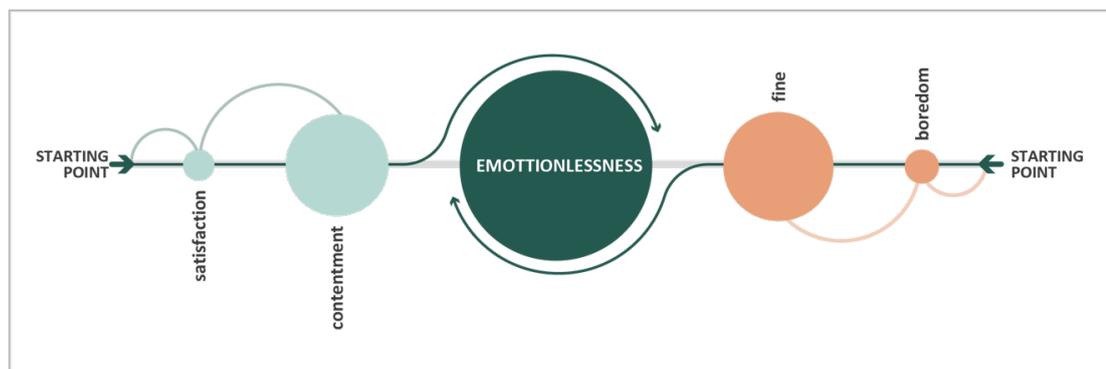


Figure 4-68. *The Transition Toward Emotionlessness: Emotional Shifts in Design Process.*

Another aspect the interview aimed to explore in greater depth students' perspectives on the emotion of anger. This emotion emerged as the least experienced and was even emphasised in the feedback sheets as being largely unrelated to the design process (see Figure 4-49, 4.4.2, p.252). By answering the following question, *'From your perspective, why do you think anger is considered an irrelevant emotion in the design process?'* different insight shows different aspects in relation to the anger emotion.

Figure 4-69 illustrates the emotional landscape surrounding anger in the context of the design process. Although anger was rarely experienced or expressed by students, when asked about it, they often associated their emotional responses with other commonly felt emotions, such as frustration and disappointment, both of which were seen as more appropriate and acceptable within the design process. This highlights that while anger as a primary emotion was largely absent, its adjacent emotions were significantly more present. Students frequently expressed uncertainty about why they would feel anger or who it would be directed toward, reinforcing their discomfort with anger as a relevant or useful emotion in

the design context. Instead, emotional intensity was often redirected into frustration, which students acknowledged as more familiar. Passion also emerged as a related emotion. This perceived contradiction between passion and anger is notable, as students often claim that having passion for something eliminates the possibility of feeling anger toward it, suggesting that strong emotional engagement could be channelled more constructively. The figure visualises this emotional dynamic, emphasising how students tended to experience and express emotions adjacent to anger rather than anger itself.

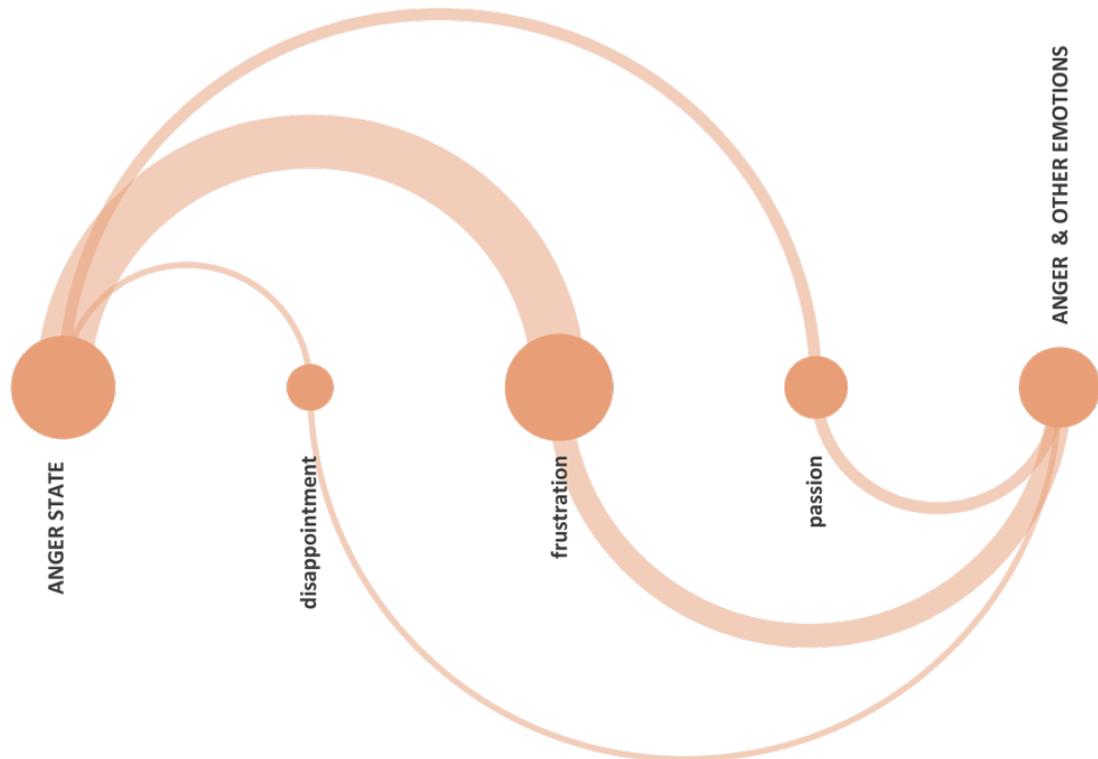


Figure 4-69. Emotional Landscape around Anger.

Building on that, an elaboration on the relation between anger and frustration seems logical. According to the previous Figure 4-26 (see 4.3.2.3, p.224) shows that students, specifically during the design process activity, exhibit these two emotions together. Yet, anger is not the significant one, but it appears to be recorded at the end of the design process. As a result, Figure 4-70 visualises the layered connections between anger and frustration responses within the design process. It traces how anger is perceived across three levels: Anger in Design, Anger Cause, and Anger State. The flow reveals that although anger may initially surface as a reaction to specific challenges in the design context, it is rarely sustained as a dominant emotion. Instead, it tends to be missing and other commonly expressed emotions appear. However, based on students' responses to questions about anger, the emotion most closely associated with it was frustration. Hence, students reflect a tendency to experience frustration more frequently, often viewing it as a more acceptable and familiar emotional response. Other emotional paths lead toward fear, particularly fear of failure or judgment.



Figure 4-70. Anger and Frustration Connections.

Additionally, a clear pattern emerged in students' responses regarding anger including anger causes, situational context, and emotional expression, all of which frequently linked to frustration. Frustration was often tied to project setbacks or experiences of failure. The diagram reflects these connections, showing that within the context of the design process, anger is missing, while other emotions that students perceive as more appropriate or manageable, such as frustration are more commonly expressed.

Although anger was initially identified as one of the least experienced emotions in the design process, the interviews helped reveal the emotional landscape surrounding this emotion. For many students, anger was seen as too intense, inappropriate, or challenging to direct, especially in an academic setting where emotional expression is often expected to remain constructive or restrained. Instead, students express their emotional discomfort as self-directed frustration; they also stated that using negative emotions to push through challenges and transform them into motivation, stating that anger can be a motivator in case it presents throughout the process. In some cases, anger was confused with or masked by other emotions like fear, jealousy, or passion, showing how emotional intensity is often reinterpreted in more socially acceptable forms. Table 4-7 presents excerpts from the interviews that illustrate students' responses. These emotional responses are grouped into five key categories that capture how students relate to or reframe the emotion of anger in their design process. The quotation list can be found in Appendix 9, p.425.

Table 4-7. Interview Extracts that Illustrate Students' Emotional Responses Related to Anger.

| Anger Related Theme and Categories  | Transcript References                                      | Students' Representative Quotes   |
|---|--|---|
| <b>Anger Is Rarely Felt or Accepted in the Design Process</b>               | S6: Q3 8:59  | <i>"I don't think I've ever been angry when it comes to design work."</i>   |
|   | S3:Q3 5:28   | <i>"I don't get mad; I get maybe quieter or upset."</i>   |
|   | S2:Q3, 07:30   | <i>"Anger is maybe a bit too strong."</i>   |
|   | S10:Q3, 11:23  | <i>"Because I like, I lead the process. So I should never really be angry at, you know, something that I've the route I've gone down."</i>  |
|   | S13:Q3, 07:44  | <i>"I feel like whenever I would be stressed, it would never transform into anger."</i>   |
| S4:Q3: 7:47   | <i>"So, like, anger is not or shouldn't be part of it"</i> |   |
| <b>Frustration and Disappointment as a Preferred or more Common Emotion</b> | S2:Q3, 07:30   | <i>"I would more so use the word frustrated rather than anger."</i>   |
|   | S1:Q3, 6:18  | <i>"I think more I would just disappoint in myself that would be stronger than I anger if I meet in a stage that I was hoping to be like"</i>   |
|   | S13:Q3, 07:44  | <i>"Stress and anxiety would come, but wouldn't get angry over the kind of whatever didn't work out. It would just be, maybe frustrates, a better word, but it wasn't anger, so to speak."</i>  |
| <b>Anger Directed Inward (Self-Anger and Personal Responsibility)</b>       | S2:Q3, 08:04   | <i>"I'm frustrated with the project or my progress, but I wouldn't say I'm angry with the project, you know, or angry with myself."</i>   |
|   | S4:Q3: 7:47  | <i>"what you are you gonna Are you angry at yourself? Like, it wouldn't make any sense."</i>  |
|   | S7:Q3 10:51  | <i>"when in your mind you want to reach a certain point in the design, but you're not able to because you keep repeating a certain step. So that's anger and frustration in my opinion"</i>   |
|   | S8:Q3, 08:29   | <i>"I don't think that you would reach a point where you're angry at the project or angry at the work."</i>   |
|   | S8:Q3, 10:00   | <i>"I felt angry, and usually the times that I felt angry is because of a person, not because of a project or a workload or myself."</i>  |
|   | S10:Q3, 11:59  | <i>"I never really get angry, yeah, but I think if I was to be from other people, like, other people, like, I don't know, like, if I was to go home after like, uni, and then my mum dad had been like, do this, do that, do that."</i> |
|   | S11:Q3, 09:33  | <i>"I feel anger sometimes when Adobe crashes, or when I lose my progress, or if I want to do something and I don't know how to do it."</i>   |

|   |              |  |
|---|--------------|--|
| <b>Anger as Motivation or Catalyst for Action</b>             | S1:Q3, 6:18  | <i>"Anger. I mean, sometimes it's a good, items, it's a good maybe motivator to continue for me."</i>  |
|   | S7:Q3, 11:34 | <i>"It pushes you. So when you get anger, you get that kind of opinion, like, I want to finish it, so I think it pushes you more to reach the final stage or the stage you want to reach to."</i>                                    |
|   | S9:Q3, 10:53 | <i>"I usually take these anger and change them into a positive reaction."</i>  |
| <b>Misinterpreting or Confusing Anger with Other Emotions</b> | S6: Q3 9:42  | <i>"I guess it comes from a place of fear, of incompetence, I guess, and lack of time."</i>  |
|   | S4:Q3, 07:47 | <i>"Is an enhanced version of being passionate, because passionate is like, the positive side, but anger is usually like, related like has a negative connotation. Like, you think of anger think of like, oh, punch and stuff."</i> |

Further clarification of emotions emerged through students' reflections, offering deeper insight into how certain emotions were understood and used in the context of their design experiences. Notably, students frequently referred to the emotions contentment and 'fine', prompting a closer examination of their meanings from the students' own perspectives. Based on their input, two distinct definitions were identified:

**Contentment (based on student perspective):**

A calm, balanced emotion marked by quiet satisfaction and acceptance. It reflects a sense of being 'okay' with what has been accomplished, neither elated nor disappointed. Students described it as a 'positive neutral', a space in which expectations have been met but not surpassed, progress feels steady, and there is no strong urge for more. Contentment typically arose after completing a task or reaching a milestone, offering a sense of peace, comfort, and self-acceptance. It was understood as a grounded and reflective emotion, subtler than joy or excitement but nonetheless affirming.

**'Fine' (based on student perspective):**

In contrast, 'fine' was often used by students to express a vague, emotionally flattened experiences. While it may appear neutral, it frequently conceals more complex or unresolved feelings. Many students viewed 'fine' as leaning slightly negative, indicating a lack of emotional investment, avoidance, or quiet dissatisfaction. It was commonly used as a way to move past a conversation or avoid going deeper into the he emotional experiences. The ambiguity of the term meant it could signal anything from mild contentment to emotional detachment. This interpretation was echoed by Jordanian students, who referenced Arabic equivalents such as 'منيحة' or 'ماشي الحال', terms similarly used to mask or downplay one's actual emotion.

These distinctions between contentment and 'fine' are essential for understanding the emotional vocabulary students employ during the design process. While both terms may appear neutral on the surface, the depth of meaning students assign to them reflects varying degrees of emotional clarity, satisfaction, and self-awareness.

#### 4.5.3.2 *Design Process and Design Project*

The perception of progress or setbacks in the design process has a significant mixed emotional impact on students. Visible progress typically fostering motivation. In contrast, setbacks often lead to discouragement or self-doubt. Many students expressed that tangible, physical signs of progress, such as building prototypes, conducting interviews, or completing pages of a portfolio, offer a strong emotional boost, giving them a sense of accomplishment and forward momentum.

Conversely, less visible work, such as background research or conceptual development, can feel stagnant and demoralising, especially when there are no clear outputs to validate the effort. Some students noted that self-managed timelines exaggerate these feelings, where the lack of external benchmarks can make them question their productivity even when they've achieved substantial results. Setbacks, particularly those that are persistent or feel beyond the students' control, such as delayed interviews or unclear feedback, often evoke frustration, anxiety, or even burnout. However, not all setbacks were seen negatively. For some, they offered a chance to reflect, improve, and deepen their work, turning difficulty into a creative opportunity.

Emotional responses were also tied to individual working styles. Students who thrive on problem-solving found certain types of setbacks stimulating, while others felt overwhelmed by the uncertainty they introduced. Additionally, peer comparison and external verification, such as supervisor meetings or juries, played a crucial role in shaping students' emotional landscapes; praise and constructive criticism could either motivate or demoralise depending on how they were delivered and received.

Ultimately, progress often fuels continued effort and enthusiasm, whereas setbacks can either stall the process or, if framed productively, catalyse renewed determination. Figure 4-71 illustrates the main themes derived from the interview responses concerning perceptions of setback and progress in the design process.

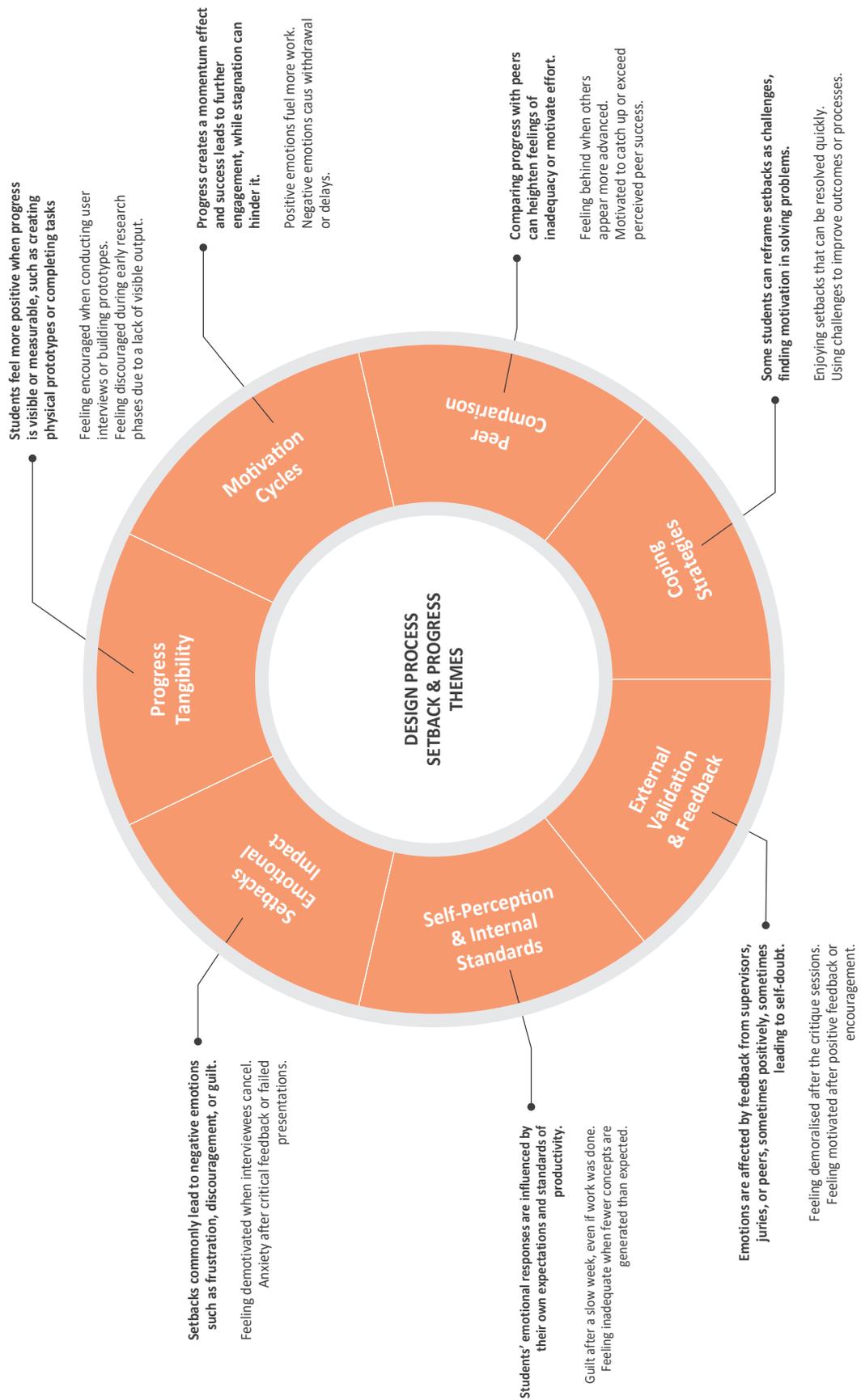


Figure 4-71. Setback and Progress Themes in the Design Process.

Further, the perception of success or failure in a design project deeply shapes students' emotional experiences, often amplifying feelings of motivation, doubt, pride, or disappointment depending on how these outcomes are internally and externally interpreted. Many students indicated that their emotional responses to success or failure are closely tied to self-perception and personal standards, sometimes even more than to formal evaluations.

Success tends to bring feelings of pride, joy, and increased motivation, especially when it aligns with validation from supervisors, peers, or jurors. It often fuels continued effort, encouraging students to refine and enhance their work further, even beyond the required scope. However, the recognition of success can also introduce a false sense of security or a desire to relax, which some acknowledged could momentarily reduce their drive.

Failure, on the other hand, generally evokes more intense and lingering emotional reactions. It can lead to self-doubt, anxiety, shame, and even procrastination, particularly when students feel they are falling short of their own or others' expectations. For some, perceived failure disrupted their workflow entirely, delaying progress as they wrestled with insecurity about the direction or originality of their ideas. However, many also described failure as a motivator, not necessarily because it felt good, but because it provoked a desire to avoid that feeling again. This fear-driven motivation was especially prevalent when students felt they were under pressure to prove their capabilities, either to themselves or others. Interestingly, students who had internalised failure as a normal part of the design process reported being more resilient, viewing setbacks as opportunities for growth rather than defining defeats.

External feedback played a dual role: feedback could validate and encourage, but also deeply unsettle when it clashed with a student's self-evaluation or seemed to invalidate their creative direction. In some cases, the same individual who delivered earlier criticism later offered praise, which students found particularly rewarding as it signalled personal growth and improved performance. Ultimately, the emotional landscape of success and failure in design is shaped not only by outcomes but by how students interpret these experiences in relation to their identity, confidence, and aspirations as designers. Figure 4-72 illustrates the main themes derived from the interview responses concerning perceptions of success and failure in the design process.

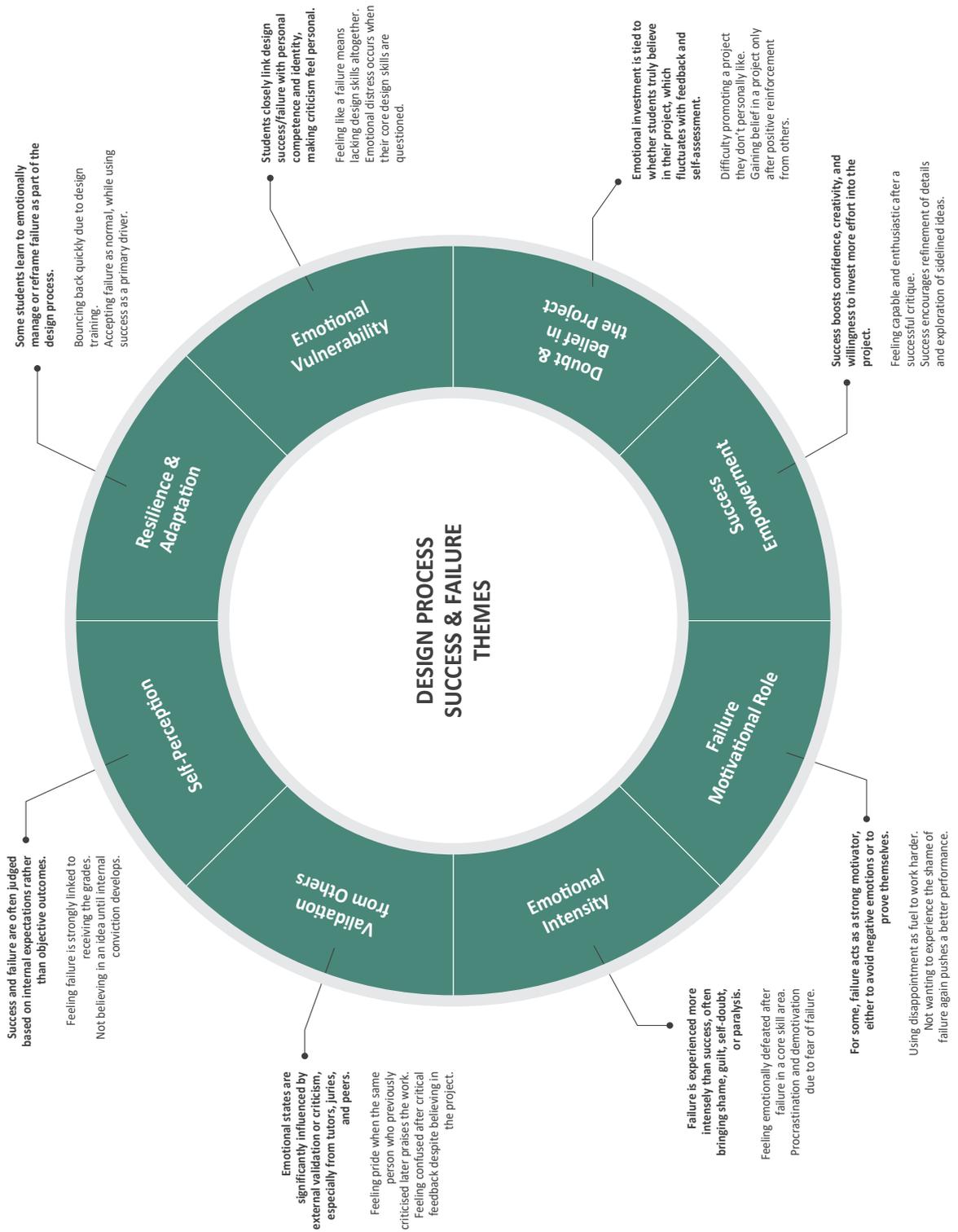


Figure 4-72. Success and Failure Themes in the Design Process.

Correspondingly, Table 4-8 illustrates the emotions that appear when students were asked about setbacks, progress, success, and failure during the design process.

*Table 4-8. Emotional Responses Associated with Perceived Setbacks, Progress, Success, and Failure in the Design Process.*

| <b>Analysis Elements</b>     | <b>Theme</b>                           | <b>Positive Emotions</b>                | <b>Negative Emotions</b>                            |
|------------------------------|--|---|---|
| <b>Setbacks and Progress</b> | Tangibility of Progress                | Satisfaction, Relief, Motivation, Pride | Frustration, Discouragement, Doubt                  |
|                              | Setbacks Emotional Impact              | Determination (when solvable)           | Disappointment, Anxiety, Demotivation, Helplessness |
|                              | Self-Perception and Internal Standards | Relief                                  | Guilt, Self-criticism, Inadequacy                   |
|                              | External Validation and Feedback       | Confidence, Reassurance, Joy            | Deflation, Confusion, Shame                         |
|                              | Coping Strategies                      | Engagement, Excitement, Recovery        | Frustration   |
|                              | Peer Comparison                        | Motivation                              | Insecurity, Jealousy, Stress                        |
|                              | Motivation Cycles                      | Momentum, energy, Commitment            | Apathy, Tired, Paralysis                            |
| <b>Success and Failure</b>   | Self-Perception                        | Pride                                   | Disappointment, Self-doubt                          |
|                              | Validation from Others                 | Confidence, Joy, Reassurance            | Doubt, Shame  |
|                              | Emotional Intensity                    | N/A                                     | Shame, Guilt, Anxiety, Disappointment               |
|                              | Motivational Role                      | Motivation, Determination               | Discouragement, Fear                                |
|                              | Success Empowerment                    | Pride, Excitement, Confidence           | Complacency (occasionally)                          |
|                              | Doubt and Belief in the Project        | Energy, Motivation                      | Disconnect, Uncertainty                             |
|                              | Emotional Vulnerability                | N/A                                     | Shame, Embarrassment, Fear of inadequacy            |
|                              | Resilience and Adaptation              | Acceptance, Calm, Determination         |   |

Moreover, students elaborated and identified a range of internal and external factors that influence their design process, and their strategies for overcoming them reveal patterns of emotional management, discipline, and adaptive thinking. Internal factors, such as overthinking, emotional tiredness, lack of confidence, and self-criticism, were often reported

as deeply affecting students' momentum and motivation. Many students acknowledged that these internal states could lead to feelings of isolation, procrastination, and even burnout. To counteract this, they employed strategies like maintaining a structured schedule, using to-do lists, breaking down tasks, and engaging in emotional self-regulation practices such as journaling. Some also leaned on peer validation and feedback to regain clarity and confidence when their belief in the project was wavering. A few spoke of emotional intelligence training or deliberate reflection practices to help them reframe emotional setbacks without taking criticism personally. On the other hand, external factors included time constraints, part-time jobs, family responsibilities, workshop or technical limitations, and social dynamics. These often led to frustration or anxiety, particularly when students felt a lack of control over their circumstances.

In response, students adopted a range of practical coping mechanisms. Some treated the design process like a job, adhering to a 9-to-5 routine to maintain work-life balance and avoid emotional exhaustion. Others learned to compartmentalise, setting boundaries between academic and personal life. Social connection also emerged as a significant buffer against both internal and external stress: spending time with friends, maintaining a sense of studio community, or simply being around others in similar situations helped many students recharge emotionally and regain motivation. Flexibility was also key, when materials were unavailable or plans failed, students pivoted to other tasks or problem-solved alternatives.

Across both internal and external domains, planning and time management were recurring themes. Students who developed realistic, personalised plans and adapted to setbacks with forward-looking solutions reported more emotional stability.

#### *4.5.3.3 Emotional Feedback and Recommendation*

This theme aims to support design education by highlighting how students' emotional experiences can be recognised as an integral part of their overall learning journey. It explores how tutors can play a role in supporting students emotionally throughout the design process and while working on their projects. The feedback was provided from the students' perspective, offering a valuable angle on how design education can better consider students' opinions and promote their wellbeing.

Figure 4-73 illustrates the categories and themes expressed by students, organised into six key areas:

1. Emotional Acknowledgement and Human Connection
2. Constructive and Balanced Feedback
3. Clarity and Direction in Supervision
4. Emotionally Sensitive Support
5. Access to Broader Support Networks
6. Relatable Mentorship and Shared Experiences

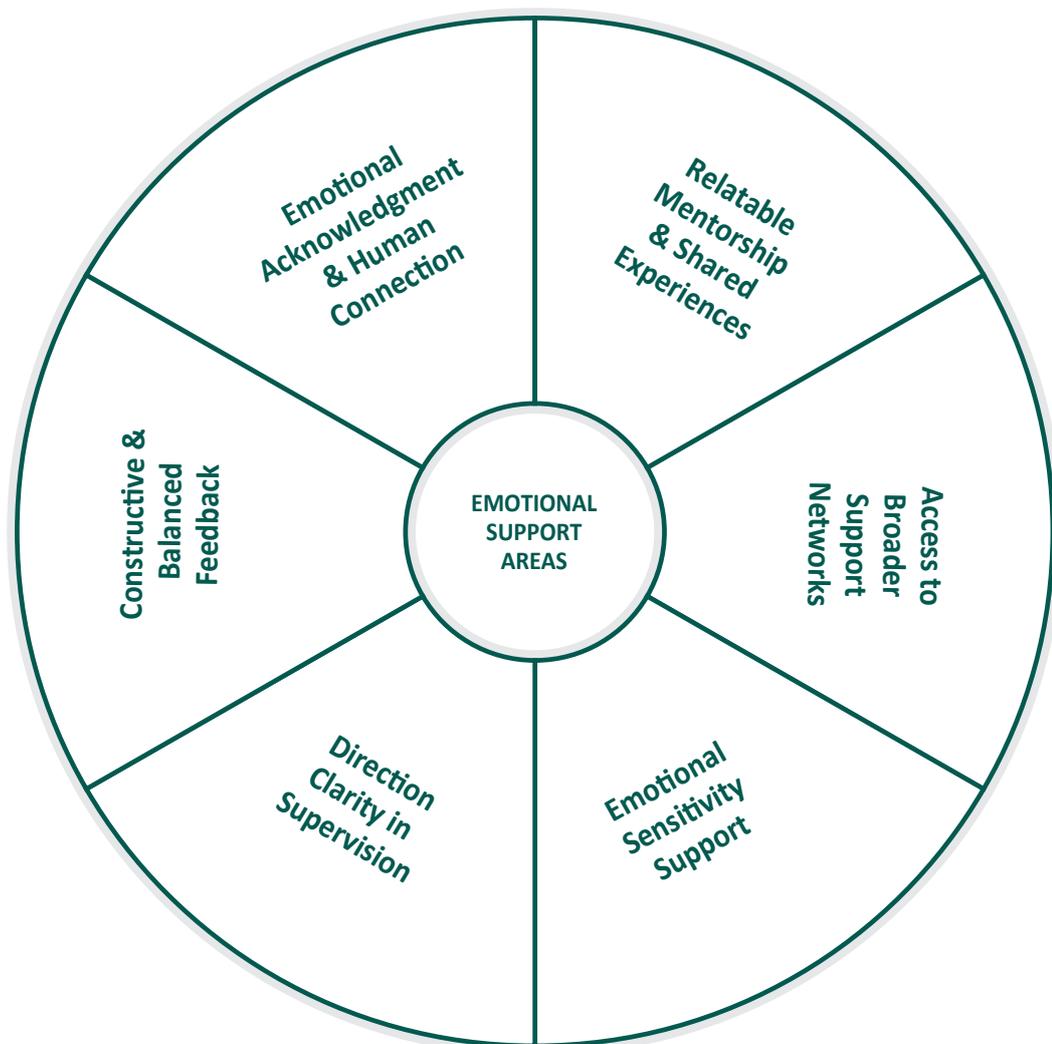


Figure 4-73. Emotional Students' Feedback Support Areas.

Accordingly, students emphasised that tutors and supervisors can meaningfully support their emotional experiences during design projects by offering clarity and providing consistent, constructive feedback throughout the process. The emotional challenges of working on long-term, self-directed design projects were a recurring theme in their reflections. Many students spoke openly about feelings of doubt, frustration, insecurity, and burnout. What stood out across responses was that students didn't expect their supervisors to solve these emotional struggles, but they deeply valued moments when tutors acknowledged them and responded with sensitivity.

Supportive supervision was described not only as academic guidance but also as a relational practice rooted in trust and emotional harmony. For example, students appreciated when supervisors checked in with a simple *"How are you feeling this week?"* or acknowledged that stress is a normal part of the process. These gestures helped normalise emotional ups and downs and reminded students that they weren't alone. Several noted that it was particularly helpful when supervisors recognised that different phases of the design process come with

different emotional demands, such as frustration during prototyping or fear of failure during critique, and adjusted their tone and approach accordingly. The ability to sense when a student was struggling and to respond with patience and support, rather than pressure, was seen as a powerful form of emotional support.

Another key insight was the importance of feedback delivery. Students repeatedly expressed how feedback could either build their confidence or unravel it, depending on how it was framed. Harsh or vague criticism, especially when not accompanied by encouragement or actionable suggestions, left students feeling demotivated and confused. In contrast, feedback that acknowledged strengths, celebrated progress, and then pointed out areas for improvement was seen as motivating and emotionally constructive. Even subtle choices in tone and language made a difference, for example, saying *“This part works well, but you might consider...”* felt more empowering than simply stating *“This doesn’t work”*. Students stressed the importance of balanced critique that honours their effort and encourages further development, rather than focusing solely on shortcomings. Clarity in expectations and project structure was also a significant emotional anchor. Ambiguity around deliverables or evaluation criteria often led to unnecessary stress, with students feeling they wasted time going in the wrong direction. Providing clear timelines, guidance, and examples of successful past projects helped students feel more secure in their progress and gave them a better sense of what was expected. This clarity was especially important in the early stages, when students were still defining the scope of their projects and needed reassurance that they were on the right track.

In addition to formal supervision, many students found emotional support through informal interactions with other lecturers, technicians, or peers. Being able to approach multiple staff members, beyond the assigned supervisor, helped reduce feelings of isolation and created a broader network of encouragement. Students valued approachable and responsive supervisors, but they also found strength in diverse perspectives, seeking second opinions or different forms of advice when needed. This openness helped them feel more confident navigating their creative and emotional journey.

Finally, students expressed that supervisors who modelled emotional intelligence and shared their own experiences of navigating design challenges, whether as former students or practising designers, made the learning environment more human and relatable. Feedback, especially from those who had been through similar processes, helped students see their struggles as part of the learning curve, rather than signs of personal failure. In this way, emotional support was not seen as separate from academic guidance, but as deeply intertwined with it, an essential part of mentoring that enables students not only to produce stronger work, but to grow as resilient and reflective designers.

## 4.6 Part One: Exploration Studies Analysis Conclusion

The exploratory studies presented in this chapter offer an understanding of how students' emotions evolve throughout the design process and the meanings they assign to these emotional experiences. A significant finding was the fluidity of emotions as students moved through various stages of their projects. Emotions such as relaxation, contentment, anxiety, and frustration were frequently reported, but their interpretations shifted depending on the context, individual experiences, and reflective insight. In some cases, students reported changes in perspective, particularly regarding complex or socially stigmatised emotions, indicating an evolving emotional understanding.

The integration of tools that benefit from psychology, design, and educational theories into the designed tools proved effective in revealing these emotional experiences. Students responded actively and thoughtfully to these probes, which encouraged them to reflect on both their emotions and the broader factors influencing their design processes. The cultural probes not only captured emotional data but also acted as a pedagogical tool, encouraging self-awareness and deeper engagement. In contrast, limitations are still inherent in these tools, and further enhancements are still needed.

Many students noted that becoming aware of their emotions was valuable in understanding their design journey. However, this awareness did not consistently lead to increased productivity or decisive action. In some cases, it contributed to hesitation, procrastination, or even paralysis, particularly during challenging stages of the process. This highlights the need for design education to not only support emotional awareness but also develop strategies to transform that awareness into constructive energy.

There were notable cultural differences in the emotional responses between Scottish and Jordanian students. The transcription and data analysis phases revealed that Scottish students appeared more open in discussing emotions like shame and pride, whereas Jordanian students rarely mentioned these feelings. This aligns with broader cultural patterns of emotional expression and suggests that emotional openness in the design process is influenced by sociocultural context.

The emotion studies highlighted peaks of both positive and negative emotions across various design process stages and project milestones. For example, weeks associated with concept development or exploration often saw high levels of positive emotions. In contrast, weeks following critique sessions or marked by reduced productivity were associated with anxiety, frustration, or emotional withdrawal. This confirms that temporal aspects of the design cycle significantly shape students' emotional landscapes.

Interestingly, a recurring theme was the emergence of emotionlessness, where students were avoiding and distancing themselves emotionally to escape discomfort or self-doubt. This emotional detachment may hinder engagement during the design process, impacting students' decisions toward their process management and progress and as a result, underscoring the importance of acknowledging and working through negative emotions rather than evading them.

The most commonly reported negative emotions were anxiety, frustration, and boredom, while the most frequently mentioned positive emotions were excitement, relaxation, satisfaction, contentment, and hope. Notably, anger was rarely reported or entirely absent. This absence of anger, which is a basic human emotion within established emotional spectrum theories, suggests a concerning trend in current design education: the suppression or unacknowledgement of anger as a valid and potentially productive emotion. Therefore, since both the preliminary and main studies revealed a notable missing of anger in students' emotional narratives despite its significance as a fundamental emotion, this insight led the research to focus on exploring anger as a potentially transformative force in the design process and design education. By investigating how anger is expressed, suppressed, and potentially mobilised in design contexts, whether anger directed at tools, systems, or personal limitations, this research aims to reconceptualise negative emotions not as threats, but as powerful instruments of motivation, critical inquiry, and innovation in design education.

The exploratory studies reveal that while negative emotions often cause discomfort, students also recognise their motivational potential. Some students explicitly noted that some negative feelings pushed them to achieve better outcomes. Therefore, rather than viewing these emotions as obstacles, the study proposes repositioning them as catalysts for critical reflection and design breakthroughs.

Building on the results from the exploratory studies, the next section of the thesis shifts focus toward a deeper investigation of the emotion of anger. This section introduces a workshop designed to explore how anger can be meaningfully integrated into the design process. As a verification step, the workshop tests the research direction and key recommendations that emerged earlier, specifically, the potential of treating anger as a significant and constructive emotion within design education and practice.

#### *4.6.1. Shaping Research Next Phase*

Building on the insights gained from the exploratory studies, the next section of the thesis places a stronger emphasis on investigating the role of anger within the design process. The absence of anger in students' emotional narratives, despite its significance as a core human emotion, highlighted a gap that warrants deeper exploration. This led to an interest in the research focus toward understanding how anger can be acknowledged, expressed, and constructively applied in design education.

To pursue this direction, the next phase involved the development and implementation of a dedicated workshop. This workshop serves as a verification step, aimed at testing the relevance and applicability of the recommendations derived from the earlier studies. In particular, it seeks to explore how anger can be embraced as a meaningful and productive emotion in design practice.

This next section sets the foundation for this verification phase, supporting the decision to integrate anger more intentionally and thoughtfully into the design process as a powerful emotional tool for transformation and as a powerful tool.

## Part Two: Verification Study Results

### 4.7 The Angry Design Workshop Results

This section presents the analysis of data collected during the Angry Design Workshop, which was conducted with eight participants, including design researchers, tutors, and practitioners. The workshop was designed to examine the emotion of anger within the context of design education and practice, a topic notably absent in current discourse and students' design process.

The motivation to focus on anger stems from results in both the preliminary and main studies. Anger consistently emerged as the least recorded and least intense emotion among students, often receiving the minimum rating of 1 on a Likert scale, or even a 0 in some cases. This underrepresentation indicates that anger is perceived as irrelevant to the design process. However, this perception contrasts sharply with existing literature, which positions anger as a potentially productive and motivational emotion, particularly within creative fields such as art, as well as in domains like sports and social activism (Yang & Hung, 2015).

Moreover, a clear connection was observed between students' high levels of frustration during the design process and broader literature linking frustration and anger. While frustration may lead to stagnation, anger, when properly understood and channelled, has the potential to incite change and drive action. This insight further supports the rationale for integrating anger as a meaningful emotional component in design education. In response to these findings, this part aims to contribute to the field by addressing specifically related to the research question three as follows:

#### **RQ3. How can the emotions of design students be effectively incorporated into their design process journey?**

*RQ3.2. How can we promote the employment of emotion in design education?*

*RQ3.3. What strategies can be employed to incorporate emotion in the design process?*

*RQ3.4. How can design tutors create a space for students to explore their emotions productively?*

The workshop aims to explore how anger can be promoted within design education to support emotional balance and motivation throughout the design process. As a result, the Angry Design Workshop was developed to evaluate the research recommendations and validate the idea of promoting anger as a constructive force in design practice.

The workshop was structured into four key parts (see 3.5, pp.177). Correspondingly, the analysis in this section follows the same structure and applies thematic analysis to unpack participants' responses. This will help surface their perspectives on anger and further elaborate on the proposed recommendations for its integration in design education.

### 4.7.1 Part One: Speak Your Mind

The first part of the workshop was designed to create space for participants to express the emotion of anger. The aim was to gain a deeper understanding of how anger is perceived and experienced, particularly within the context of design. Students noted that anger is a strong emotion and sometimes a difficult word to use, which highlighted the need to explore it further. This stage of the workshop also sought insights from more experienced designers to broaden the perspective. Participants were given paper cutlery as a medium through which they could visually represent their personal interpretations and experiences of anger (Figure 4-74).

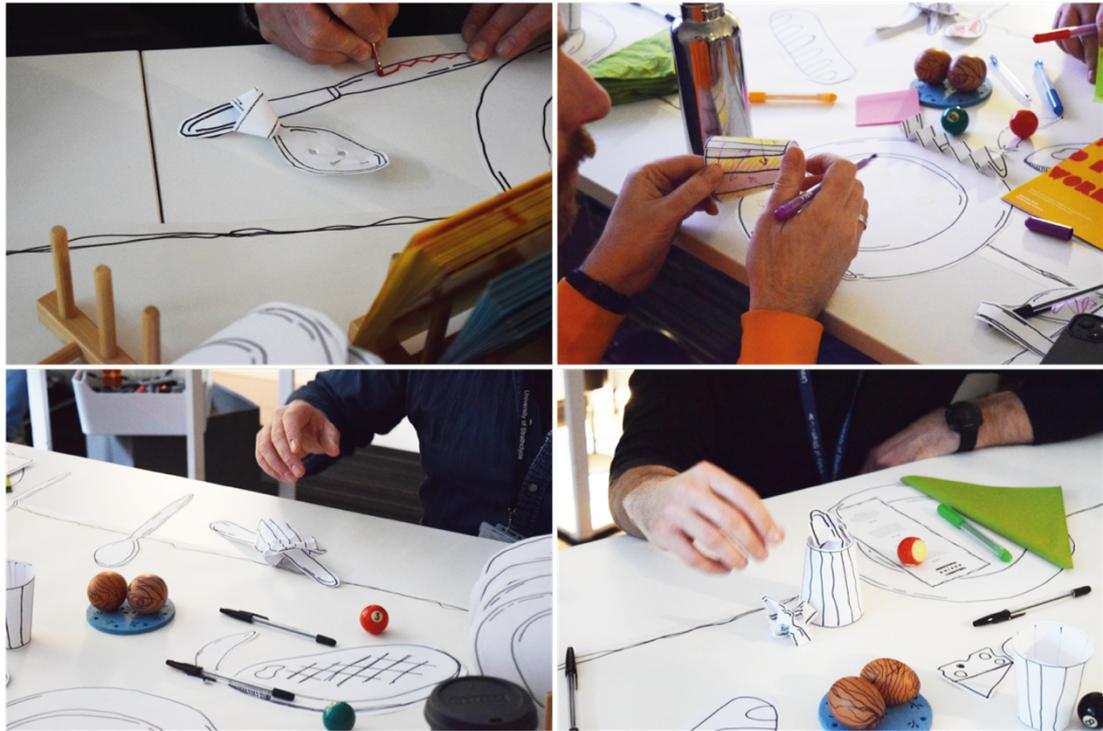


Figure 4-74. Workshop Part One: Participants Expressing their Understanding of Anger.

Figure 4-75 illustrates the collection of paper cutlery, including spoons and knives, which was used by the participants. Each piece of cutlery has been altered in some way: some are crumpled, others torn or folded, and a few have holes punched through them. Many are marked with handwritten words, scribbles, and drawings. Overall, the image reflects the emotional intensity that often characterises the experience of anger.



Figure 4-75. Workshop Participants' Anger Expression Visualisation.

Accordingly, some of the cutlery appears aggressive; one knife has jagged red shapes along its edge, resembling teeth. Another is pierced, possibly with a pen, evoking a sense of attack. A few are bent or twisted, as if forced into uncomfortable positions, reflecting tension or pressure.

In contrast, some pieces are more intact but heavily drawn on, layered with overlapping forms or paired together in tight bundles. Several spoons are placed facing each other, sometimes joined, which may hint at emotional confrontation. Others are isolated or visibly deformed, giving a sense of vulnerability or emotional collapse. Crumpled scraps lying off to the side, torn from the main compositions, may suggest rejection, breakdown, or emotional overflow.

The overall scene communicates a strong sense of personal and physical embodiment of anger. From the figure, it is clear that the participants perceive anger as a complex, multidimensional emotion that manifests through both physical disruption and emotional intensity. The responses suggest that anger is not a singular experience but a dynamic force that spans a spectrum of expression. Anger can be described as strong and rough, revealing its raw, unfiltered energy. Moreover, anger is chaotic with unsettled order, sharp in its expression and can be destructive and disordered. Despite the negative tone in the participant's expression, anger is still perceived as a powerful form of expressive

communication and as a way to convey emotions and experiences that cannot be easily said in some cases (Figure 4-76).



Figure 4-76. Anger Individual Visual Representation.

In summary, participants illustrate anger as simultaneously empowering and destabilising. It is expressive, protective, and sometimes destructive, capable of creating rupture or demanding change. The way they manipulated the cutlery shows an understanding that anger is not just about aggression, but about navigating internal and external tensions through action, expression, and transformation.

### 4.7.2 Part Two: Self-Reflection Questions

The second part of the workshop was designed to provide participants with an opportunity to elaborate on their perspectives on anger. This was done through five cards (Figure 4-77), each containing a question related to a different aspect of anger, particularly the potential for integrating anger into the design process within the context of design education (see 3.6.2.2, pp.185). This activity was intended as a self-reflection exercise, without any initial sharing of thoughts, to give each participant the freedom to express themselves openly and without influence from others' opinions.



Figure 4-77. Workshop Part Two: Reflection Cards.

This section's analysis results will be presented according to the question's primary focus, using a thematic approach to organise the responses and insights based on the emerging thoughts and opinions. Consequently, Figure 4-78 first confirms that most design participants support the idea of integrating anger into the design process of today's recording (75%) of the participants' opinions. Second, all participants strongly agreed that they had experienced situations where anger led to a creative breakthrough, with 100% agreement. These initial percentages highlight a promising aspect of the research approach and findings.

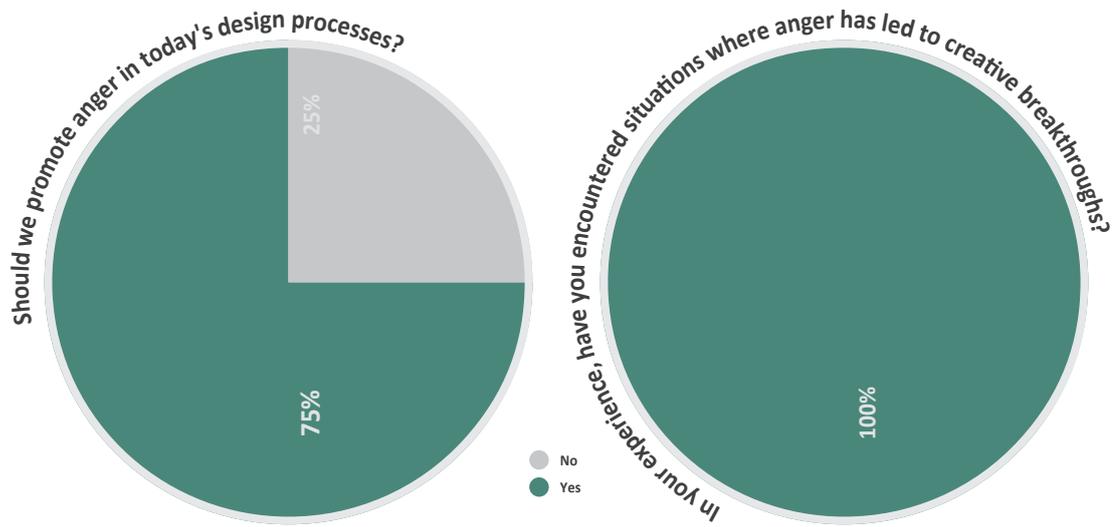


Figure 4-78. Anger Perception in Design.

#### 4.7.2.1 The Importance of Promoting Anger

Participants justified the promotion and integration of anger as a productive emotion in the design process for several reasons (Figure 4-79).



Figure 4-79. Reasons Supporting the Integration of Anger in the Design Process.

First, anger was seen as a powerful force for driving change and challenging norms, prompting designers to question existing solutions and resist passive acceptance. Second, participants emphasised that anger acts as a motivator for action, fuelling determination to tackle real-world problems through impactful design. Third, anger was recognised as an emotional catalyst, capable of sparking other productive feelings and leading to a more authentic and emotionally rich creative process. Fourth, it was believed that anger enables boundary-pushing and innovation, helping designers go beyond conventional approaches and strive for better solutions. Fifth, participants acknowledged the need for the constructive use of anger, stressing that when combined with strategic thinking, anger can lead to meaningful and sustainable change rather than destructive outcomes. Sixth, they highlighted the importance of balancing anger with empathy, collaboration, and purpose, arguing that a thoughtful emotional mix fosters long-term, socially responsible designs. Seven participants agreed that anger is important in creating a meaningful impact, allowing designers to respond to urgent societal challenges with passion and clarity of purpose, which in turn supports the value of authenticity in design and will enable designers to bring their full emotional experiences into their work. In contrast, some participants reinforced that suppressing anger may lead to disengagement and missed creative opportunities.

#### *4.7.2.2 Shifting the Narrative: Rethinking Anger in Design*

Based on the participants' perspectives, changing the perception of anger begins with reframing it as a constructive force. First, they suggest viewing anger not as something inherently negative or disruptive, but as motivated determination, a form of emotional energy that can push action and creativity. Second, participants emphasised the importance of reframing it as a constructive force, recognising that it often stems from deeply held values and a desire to address injustice or create positive change. Third, they advocate for embracing the discomfort and complexity that comes with anger, drawing on various researchers' perspectives who argue for staying with tension rather than suppressing it. Fourth, honesty and openness are seen as essential; participants support normalising anger and encourage such emotion to deepen understanding and social connection. Fifth, participants believe that we must redirect anger into positive action, using it as a fuel for advocacy, creative output, or problem-solving. Sixth, there is a strong awareness of cultural and contextual influences on how anger is perceived and expressed, urging for flexible, reflective approaches based on one's background. Finally, participants advocate for using anger as a force for change, embracing it as a valid and powerful emotion that, when harnessed intentionally, can challenge the status quo and lead to meaningful progress. These points are illustrated in Figure 4-80.

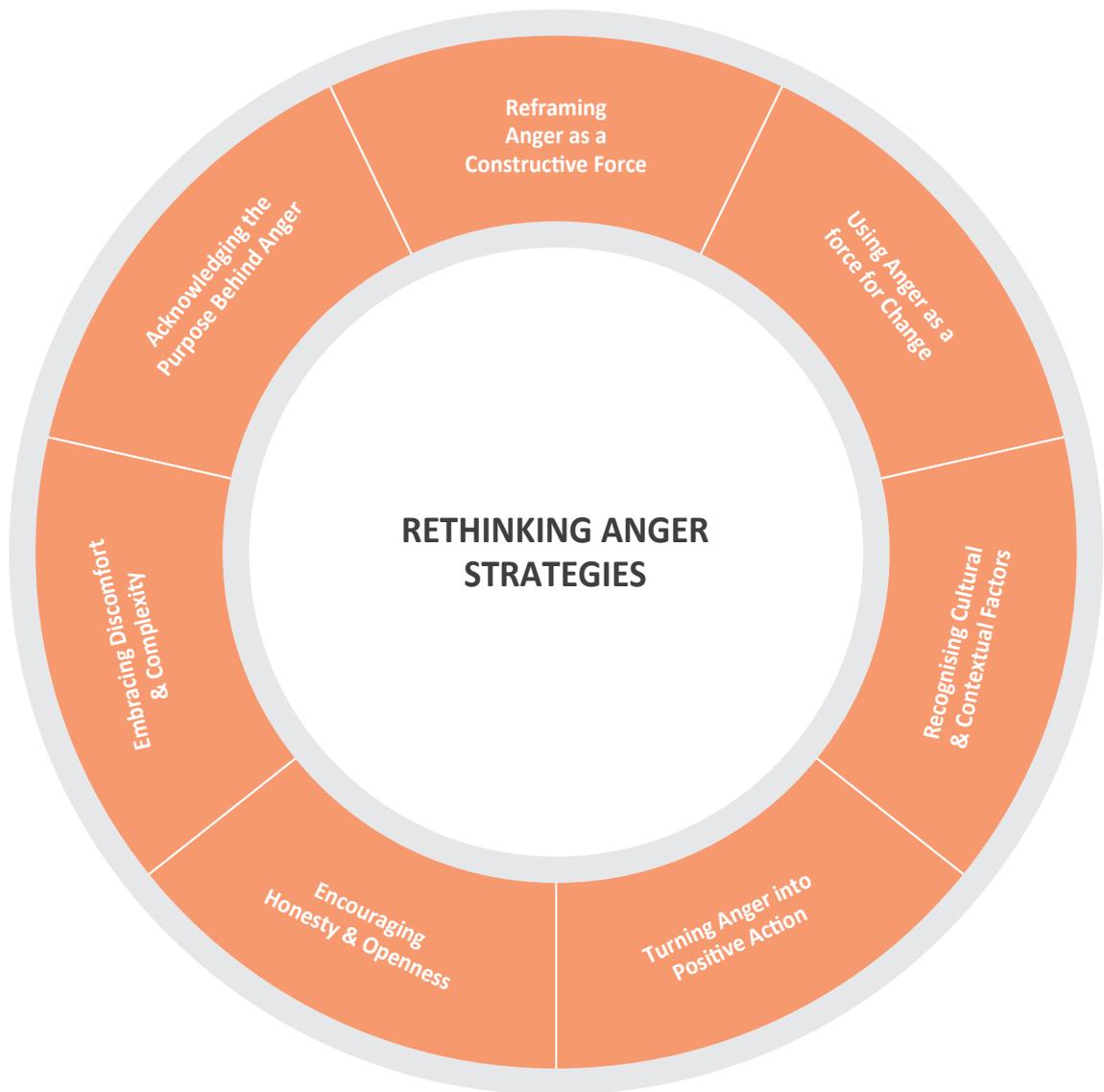


Figure 4-80. Changing the Way We See Anger: Key Influences.

#### 4.7.2.3 Creating a Space for Anger in Design Education

While participants acknowledged that anger is often viewed as a disruptive emotion, their responses to question three in the second part of the workshop aimed to uncover strategies for harnessing anger as a powerful tool in design education. Correspondingly, Figure 4-81 outlines key strategies tutors can adopt to help students reflect on their emotional experiences, express themselves productively, and transform anger into a motivating force within their design process, collaborative work, and ethical practice.



Figure 4-81. Anger Exploring Aspect in Design Education.

The figure suggests seven key areas that can form part of strategies for integrating anger, whether in educational or professional design contexts, as follows:

- **Encouraging Self-Reflection**  
Students should be given opportunities to reflect on their personal experiences with anger and how these moments influence their creative decisions. By exploring the root causes of their anger, they can begin to understand how emotional tension can be transformed into thoughtful and meaningful design responses.
- **Establishing a Supportive Environment**  
Creating a space where students feel safe expressing their emotions without judgment is essential. Open conversations and emotional support can help them

channel anger constructively, while clear ground rules ensure that ethical and safety considerations are respected.

- **Using Anger as a Creative Motivator**  
Anger can be channelled into productive energy through hands-on design activities, such as model making or expressive art. Structured, low-pressure creative exercises can give students the freedom to explore their emotions without fear of failure, revealing how anger can inspire change, beauty, and innovation.
- **Structured Exploration with Clear Guidelines**  
Anger can be explored through controlled, step-by-step methods, similar to practices in meditation or disciplined training. By guiding students through stages such as acknowledgement, direction, and resolution, the emotional intensity of anger can be integrated meaningfully into their design process.
- **Promoting Collaboration and Open Dialogue**  
Design is inherently collaborative and emotional. Providing space for peer dialogue and group work helps students share and process their emotional experiences. Embracing the emotional and literal messiness of the design studio can lead to richer, more empathetic design outcomes.
- **Facilitating Ethical and Responsible Expression**  
Students should be supported in identifying the sources of their anger and guided in ethically expressing these emotions through design. They must also be made aware of the broader social and moral implications of their work.
- **Encouraging Iteration and Learning from Mistakes**  
A culture that embraces experimentation and mistakes allows students to see frustration, which has its own relation to anger, as part of learning. Supporting this mindset helps them view failure as a necessary and constructive part of their creative growth.

#### *4.7.2.4 Incorporating Anger in Design Education*

Incorporating anger into design education can begin by encouraging critical engagement with ethical and social issues. Using anger as a lens, students are invited to confront uncomfortable realities and challenge the status quo. This involves introducing concepts such as making and breaking the rules, which help students push boundaries and foster critical thinking about systemic injustices and encouraging them to identify problems that genuinely evoke their emotions and allow personal grievances to become fertile ground for impactful design work. Figure 4-82 collectively includes the main strategies mentioned by the participants.

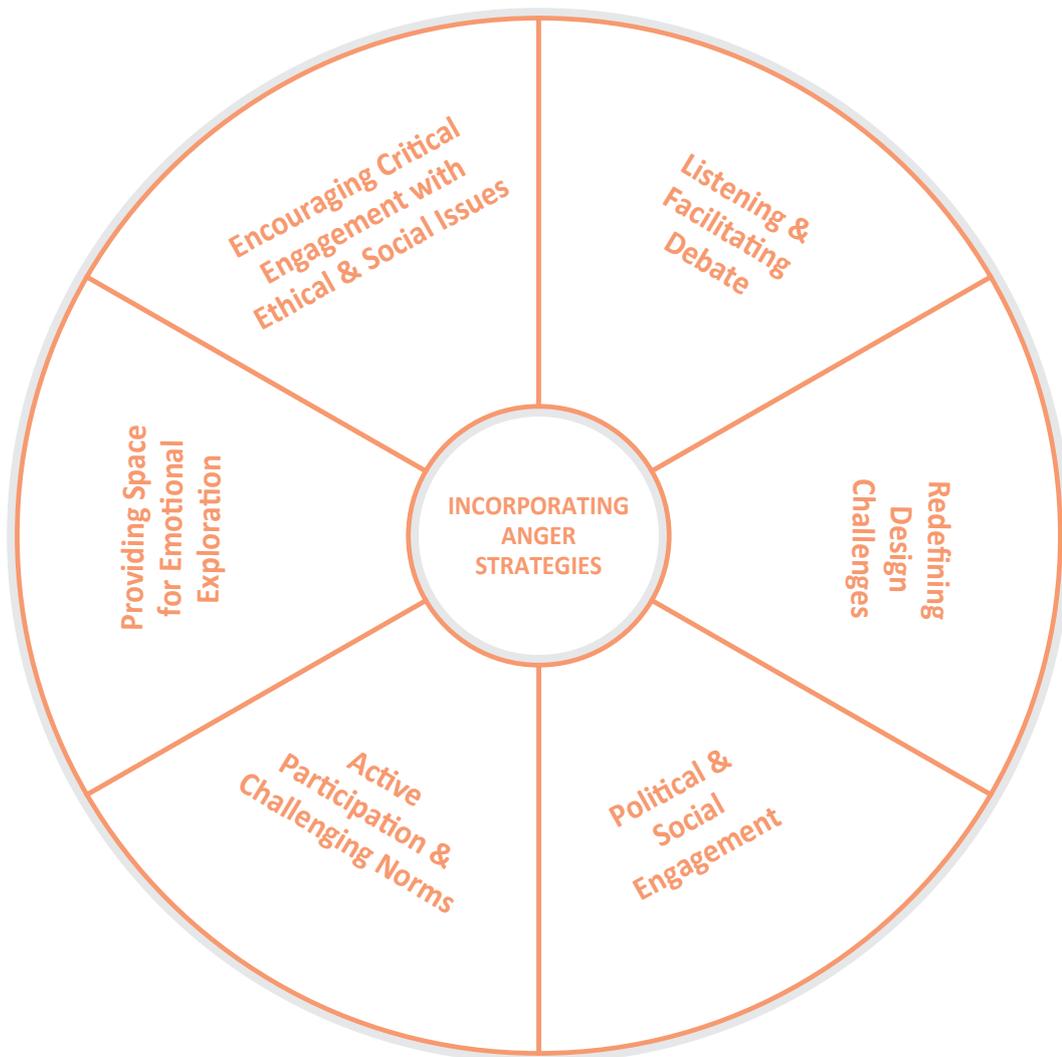


Figure 4-82. Anger Blending Strategies in Design Education.

Providing space for emotional exploration is essential in helping students harness their anger productively. Creating an environment where emotions can be expressed without judgment allows students to reflect on their frustrations and channel them into creative processes. Allocating time for emotional experimentation encourages students to break away from conventional methods and explore alternative, often more daring, design solutions. Further active participation and the deliberate challenging of norms can also activate anger as a helpful force. Designing tasks that progressively introduce frustration, through constraints or provocative themes, teaches students how to manage emotional intensity and use it as a problem-solving tool. Encouraging debate and the challenging of preconceived ideas helps students develop a stronger voice, taking clear stances on contentious issues while exploring unexpected creative directions.

Political and social engagement through design can further mobilise anger toward productive ends. Facilitating discussions around societal and political topics enables students to express care, passion, and resistance. Activism-driven projects allow students to address real

injustices through design interventions, giving their work a purpose beyond aesthetics and function, one rooted in change and advocacy. Moreover, redefining the nature of design challenges helps students engage more deeply with their own emotional responses. Instead of framing tasks around improving things, students can be encouraged to solve issues that provoke anger or discomfort. This mindset embraces emotion as an integral part of the design process, driving more meaningful and contextually designed works. Additionally, listening and facilitating debate are critical to supporting students in this emotionally charged territory. Creating space where emotions are heard without the pressure of immediate resolution validates students' experiences, allowing them to feel understood and supported. Structured debates provide a platform for diverse perspectives, allowing anger to be explored and articulated constructively, thereby fostering a deeper understanding of both oneself and others in the design process.

Participants were able to propose concrete practices that support their perspectives and could be applied within design education. These examples included methodologies that design tutors can explore and implement to observe their outcomes and impact on students' design processes.

One notable suggestion involved drawing insights from a case study on prisoners who, driven by frustration and a lack of resources, created improvised artefacts (Martin, 2022). This case powerfully illustrates how anger can lead to inventive and resourceful design solutions. In a conversation with one participant who is a design tutor, it was explained that constraints, whether material, situational, or systemic, can provoke emotional responses such as anger, which in turn can drive a new problem-solving approach. The discussion also touched on how challenging norms, particularly ethical constraints, and proposing emotionally charged projects that question or push against these boundaries, can open pathways to innovative solutions, even when navigating ethically complex territory.

In addition to the previous theoretical and reflective approaches, participants also offered specific methods and tools to integrate anger into the design classroom actively. One such method is the energetic starter task, which involves beginning a project with a physical activity that allows students to express anger, such as freehand drawing or rapid model making. These tasks emphasise the process over the outcome, encouraging raw exploration and emotional release. Another suggested method is the sensory disruption challenge, where students are asked to disassemble a product while wearing thick gloves and exposed to irritating sounds. This task is designed to heighten students' emotional experiences and test their responses under pressure. Finally, critical design challenges were proposed, projects that provoke deep reflection and push students to confront societal issues. A compelling example is the Architectural Scotland Alliance for Palestine (ASAP, 2023) which positions design as a form of political and ethical activism.

These examples show that anger can be meaningfully integrated into design education through practical, embodied, and critical exercises that go beyond the boundaries of traditional pedagogies.

#### 4.7.2.5 Personal Experiences of Anger

As the final question in this section focuses on participants' real-life experiences that led to a breakthrough design decision, solution, or shift in a situation, the aim was also to explore the type of change anger can provoke and the kind of productivity it can generate. These examples can be sorted into six groups (Figure 4-83).

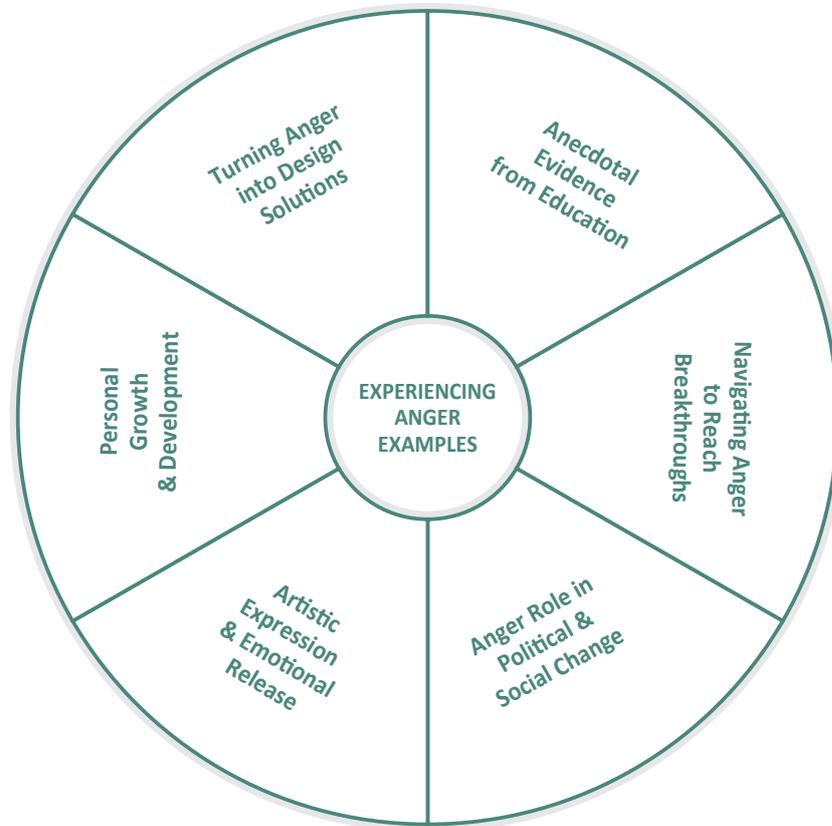


Figure 4-83. Personal Anger Experiences Example.

Notably, these examples have a connection to the previous question and the example suggested by the participants, and they include:

- **Turning Anger into Design Solutions**

Anger directed at systemic issues often drives designers to create impactful, practical solutions. For instance, anger over the lack of step-free access in public transport has inspired the design of ramps and other accessibility innovations. Similarly, student anger at inadequate public toilet access has led to creative projects aimed at improving inclusive infrastructure, showing how emotional responses can spark proactive, solution-oriented design.

- **Personal Growth and Development**

Anger is also frequently internalised, manifesting as frustration with one's limitations or perceived lack of progress. This emotional tension can push designers to grow, such as during job transitions where disappointment with personal performance becomes a catalyst for refining skills and discovering one's unique design style. In many cases, self-directed anger fuels breakthroughs by encouraging reflection and experimentation with new techniques.

- **Artistic Expression and Emotional Release**

In creative practice, anger can serve as a powerful emotional release that fuels artistic innovation. Expressive gestures, such as aggressive mark-making or scribbling, often result in dynamic, unexpected outcomes. These acts of release allow designers to bypass conventional constraints and unlock new aesthetic territories through raw emotional expression.

- **The Role of Anger in Political and Social Change**

Designers working on political or social issues often channel anger and grief into powerful interventions. This emotional drive helps identify injustices and energises the process of advocating for change. Anger, in this context, becomes a source of resilience and passion that challenges existing norms and inspires bold, purpose-driven design.

- **Navigating Anger to Reach Breakthroughs**

While anger can initially cloud judgment, it often plays an important role in unlocking innovative thinking. Once the intensity subsides, it can sharpen focus and reveal new perspectives. Designers who embrace and work through their anger often find themselves arriving at more creative, well-considered solutions than they might have through calm reasoning alone.

- **Anecdotal Evidence from Education**

In educational settings, anger and frustration are common emotional responses to tasks that are challenging. These emotions should motivate students to adapt their strategies and experiment with different approaches, leading to creative breakthroughs. While frustration often fosters persistence, anger tends to prompt bold, sometimes disruptive actions, both of which contribute to deeper learning and inventive outcomes.

### 4.7.3 Part Three: Focused Group and Open Discussions

In the third part of the workshop, participants were divided into small focus groups, each consisting of two individuals (Figure 4-84). These groups were asked to discuss two key questions designed to stimulate reflection and dialogue on the topic of anger in design: **What problems or concerns do you have regarding anger? and How can anger be a motivator for the design process, or how can it fuel the design process?**. The aim was to encourage participants to share thoughts in intimate settings before opening the floor to broader group discussion.



Figure 4-84. The focused Grouped and the Open Discussion session.

Participants raised several concerns about anger, emphasising that it needs to be carefully managed and productively directed to prevent negative impacts. They highlighted the importance of safe spaces for expressing and exploring anger in design contexts. While some saw anger and passion as distinct, arguing that passion tends to engage others, whereas anger may alienate, others pointed out that anger when communicated effectively, can drive innovation and it is part of being passionate. Still, mismanaged anger was seen as potentially intimidating or disruptive in collaborative environments. It was also noted that, in some situations, expressing anger privately might be more appropriate, and that anger, while powerful, should be balanced with positive emotions to be constructive.

Many participants recognised the motivating potential of anger. They described it as a signal for needed change and a powerful driver when channelled with intention. Anger, especially when mixed with other emotions, can fuel action and push creative boundaries. The discussion emphasised the importance of handling anger with care to avoid it turning negative. Compassionate anger, particularly in education and the arts, was seen as a force for meaningful change. Lastly, participants noted that gender plays a role in how anger is perceived and accepted in professional settings, influencing how it can be expressed and utilised in design processes.

#### 4.7.4 Part Four: Change in Perception

As we reached the final part of the workshop, and after all the discussions and experiences designed to immerse participants in the topic, this section aimed to explore whether their perceptions of anger had shifted. The conversation was reopened with the same core question about how do they now perceive anger.

It was observed that the workshop's short duration may not have been sufficient to change participants' opinions, yet the workshop successfully opened a space for dialogue around anger. This led to new reflections on an emotion that is rarely discussed productively or constructively, especially within design education contexts. The visualisations created by the participants in this final phase reflected a noticeably calmer interpretation of anger. There was a greater emphasis on harnessing anger as a useful emotional tool in design. Compared to their initial expressions shown previously in Figure 4-75 (4.7.1, p.293), these later expressions appeared more structured, with less distortion, indicating a shift in tone and perspective.

Figure 4-75 (4.7.1, p.293) includes physical manipulation (tearing, crumpling, bending) of the paper pieces, symbolising destructive, chaotic, or intense reactions. The tone is aggressive, unprocessed, and emotionally charged. In contrast, Figure 4-85 presents paper plates filled with written reflections. The format is neater, evoking a sense of containment or order. The tone has noticeably shifted to one of calm introspection. Phrases like *"I am relaxed in my anger,"* *"USE EMOTION,"* and *"It's good to be angry"* demonstrate a reframing of anger as something valid, manageable, and even productive. Rather than suppression or outburst, there is a suggestion of integrating understanding and using anger thoughtfully.



Figure 4-85. Individual Anger Representation at the End of the Workshop.

## 4.8 Part Two: Verification Study Analysis Conclusion

As outlined in section 4.6, the research aimed to explore how the emotion of anger could be meaningfully integrated into the design process. Following the exploratory studies, the Angry Design Workshop was developed as a verification step to test the key recommendations. The workshop investigated perceptions of anger within design education and practice areas where anger is typically underexplored or avoided altogether.

In the initial phase of the workshop, participants' visual and verbal expressions revealed a rich, embodied understanding of anger as a raw and multidimensional emotion. Visualisations conveyed high emotional intensity and physical disruption, with participants' expressions showing anger as chaotic, sharp, expressive, and disordered. This reflected their recognition of anger as a deeply felt, often overwhelming emotion, but also one with transformative potential.

Through reflective exercises, participants began to articulate anger not just as a negative force but as a potential force for design. They highlighted its capacity to drive change, challenge the status quo, and motivate action. Anger was frequently associated with a desire to correct injustice or push boundaries, seen as fuel for meaningful design outcomes with social, political, or economic relevance. This aligns with the broader insight that anger, when constructively framed, can express values and determination, and enhance the design impact.

The workshop also validated the importance of creating supportive and open learning environments. Such environments enable students to explore and channel their anger ethically and collaboratively through structured, low-pressure activities and open dialogue. When embedded in practical design methods such as energetic starter tasks, sensory disruption exercises, and critical design challenges, anger became a tool for reflection and innovation.

Importantly, participants cautioned that anger must be managed with care. While its motivating potential was widely acknowledged, there was consensus on the need for emotional safety and the cultivation of balance between anger and other emotions. Compassionate, intentional engagement with anger was seen as vital to preventing disruption and fostering constructive outcomes.

Overall, the Angry Design Workshop confirmed that anger can be meaningfully integrated into design education when approached thoughtfully. It supported the exploratory results by demonstrating that anger, when recognised, structured, and ethically guided, can enrich design practice and empower students to engage more deeply with critical, real-world issues.

## 4.9 Summary

This chapter presented the results from two main phases of the research: the exploratory study, which used four methods, and the verification study, which applied two key methods. The chapter was structured around the tools that guided each research step, initial results from the exploratory phase informed the design of the main study, and results from both phases shaped the final recommendations and focused the research on the role of anger in design. A detailed explanation of methodologies and approaches was included, supported by visualisations charts and figures. The exploratory study revealed how design students experience and interpret emotions throughout their projects. Emotions like anxiety, frustration, and contentment shifted across different stages, and cultural probes helped uncover these feelings. However, emotional awareness did not always lead to action, and cultural differences emerged. As a result, Scottish students were more open about shame and pride than Jordanian students. In addition, an imbalance experiences was uncovered. Some students disengaged emotionally to avoid discomfort. Anger was notably absent, leading to a new focus of this research. The Angry Design Workshop was built on these findings, showing that anger, while intense, can be a powerful and constructive force in design when handled ethically. Workshop participants viewed anger as a motivator for change and critical thinking, especially in addressing real-world issues. The workshop also emphasised the importance of safe, supportive environments for channelling anger productively. A common ground between the first part and the second part that anger was understood as a form of care, with participants noting that anger presence often signals deep concern for the situation, the outcome, or the decisions being made. It is also worth mentioning that students identified the concept of care as central to their engagement; when they felt a lack of care toward their project, it often led to disengagement and procrastination, which in turn negatively affected their overall emotional experiences during the design process.

Figure 4-86 consolidates and highlights the value of each method employed in this research and where the method's values can be most beneficial within the two areas: design process and design education. Building on this, the next chapter will expand on the main findings, drawing connections between all elements of the study to form a cohesive understanding of the research connected points.



Figure 4-86. Thesis Research Methods Value Area.



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*This chapter brings together key findings from the research, presenting an emotional mapping of students' design journey and examining how emotions shift across different stages of the design process. Through visualisations and analysis, it repositions emotions as strategic elements in design education, highlighting their role in shaping learning and design engagement.*



## 5.1. Introduction

This chapter discusses the findings gained from this research effort. The discussion will highlight and create connections between the findings to make sense of the significant results that emerged from the analysis phase.

Central to this chapter is a cumulative emotional mapping of the students' journey, supported by a visualisation that captures their emotions across different stages of the design process. This mapping enables a broader understanding of how emotions unfold in students' design process within a design education scene, with particular attention to the interactions between emotions and specific phases of the design process.

The chapter opens by examining the emotional journey of the design process, focusing on the emotional dimensions of students' experiences, including activity and achievement emotions and how these are distributed across various stages of the process. This is followed by an analysis of broader patterns and recurring emotional experiences that surfaced across the collected data.

The discussion then shifts to specific emotional phenomena, including the emergence of the Design Neutral Schema and the recurring absence of anger. These experiences are analysed in depth, raising questions about their potential impact on students' design journey. In particular, the chapter challenges dominant assumptions about anger, exploring its possible role as a motivational or strategic force within the design process.

Building on these insights, the chapter develops two central recommendations: first, that anger should be rethought as a legitimate and potentially productive element of the design process experiences; and second, that incorporating anger as a strategic tool may benefit students' emotional engagement and design process progress and development.

The final sections evaluate the research tools used to collect emotional data, reflecting on their usability, reliability, and overall contribution to design education. The chapter concludes with a summary of the key findings, laying the groundwork for the concluding discussion in the next chapter.

This chapter will guide the reader through a reassessment of the results obtained from all the studies and summarising the key findings.

## 5.2 Design Process Emotional Journey

The students' emotions during the design process were reported across different design projects, timeframes, and students' academic year levels. As a result, and to maintain the robustness of the discussion without any misleading information, this section will be divided into two parts: the first part focuses on the dimensions of design students' emotional experiences, and the second part discusses the distribution of design students' design process stages and the related emotions representation, and finally, the design journey pattern across both studies.

### 5.2.1 Dimensions

The students' emotional experiences were examined and analysed using the framework of the academic emotions approach by Pekrun et al. (2007). In addition to the core emotional dimensions of valence (pleasant versus unpleasant) and arousal (active versus deactive), this framework focuses on the academic emotions aspect, which includes the third dimension of object focus (see Table 2-3, 2.4.2.1, p.119 and 3.4.2.3, pp.158). This dimension distinguishes between activity-related emotions and achievement-related emotions. Accordingly, the following subsections are structured in accordance with this division. The first subsection focuses on activity emotions and discusses students' emotional responses during the design process. The second subsection discusses achievement emotions, which relate to students' emotions related to their self-achievements and reflections on their outcomes.

#### 5.2.1.1 Activity Emotions

Findings from both the EmotionProbe and the Emotion Tracker studies reveal insights into the similarities and differences of the activity emotional dimension of students' experiences during the design process, despite the different aspects of each study. These two studies capture and quantify emotions through their frequency and intensity, providing insights into how specific emotions manifest within the design process.

Accordingly, Figure 5-1 illustrates two aspects of these experiences: the proportion of emotions reported by students and the average intensity of those emotions. In the first study, students were free to choose from a list of 48 emotions (see Figure 3-10, 3.3.2.1, p.148) and were asked to rate the intensity of their reported emotions. In contrast, the second study focused on the five activity-related emotions and asked students only to rate the intensity of those emotions using the same scale (see Figure 3-21, 3.4.2.4, p.163). Given the differences between the two studies, this section's discussion is based on specific emotions adapted from Pekrun's emotion framework (see Table 3-3, 3.4.2.3, p.159) which includes five related emotions: enjoyment, relaxation, anger, frustration, and boredom. Therefore, if an emotion appears in the second study but not in the first, the reason is either that the emotion was not selected by any students in the first study or that the emotion was not included in the original list provided in the first study.

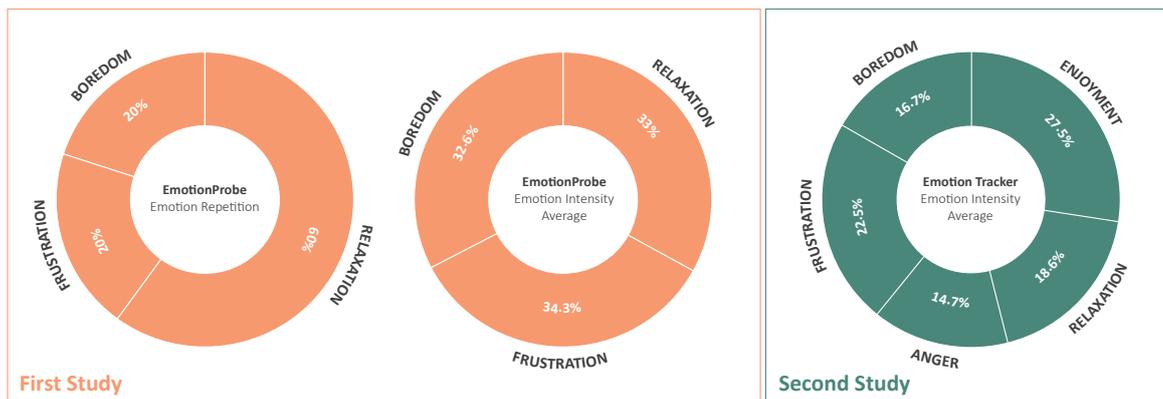


Figure 5-1. Design Students' Experiences of Activity Emotion During the Design Process. Research Exploratory Studies: Left, Study One; Right, Study Two.

Consequently, both studies include the activity-related emotions of frustration, relaxation, and boredom. Notably, frustration emerged as a high-intensity emotion in both contexts. In the EmotionProbe study, frustration had the highest intensity average (34.3%), while in the Emotion Tracker study, frustration was the second-highest (22.5%) after enjoyment. This suggests that although it is not the most frequently occurring emotion, according to its repetition in the first study, when students experience frustration, they often feel it with significant emotional strength. In addition, findings related to frustration, as illustrated in the design process trend visualisation (see Figure 4-26, 4.3.2.3, p.224), reveal that this higher intensity tend to emerge during the final stages of the design process. This pattern underscores an imbalance in students' emotional experiences, with frustration becoming particularly prominent toward the end. The pattern highlights frustration as a present emotion that can significantly shape students' perceptions of their engagement and sense of progress, particularly as they approach project completion. Further, the questionnaire reveals that students consider frustration to be highly relevant to the design process. Besides that, the interview revealed several reasons why the students felt frustrated. Sometimes, students reflect on the political instability and environmental crisis factors that have impacted their perception of making a change, causing feelings of futility toward their design motivations. Others stated their frustration at being overwhelmed by stages that required more technical skills or knowledge, as well as their limited understanding and abilities related to the design problem. Moreover, students reported that emotions such as frustration made it difficult for them to regulate the situation, which in turn affected their decision-making to progress during the process.

Relaxation, however, shows a consistent but moderate intensity across both studies, (33.0%) in the EmotionProbe study and (18.6%) in the Emotion Tracker study. While it was the most frequently reported emotion in the EmotionProbe study, relaxation intensity remains lower than frustration, reinforcing that relaxation reflects a general feeling of comfort within the design process activity. This sense of comfort, as expressed by students, also influenced their decision-making, often causing them to hesitate or resist moving forward in the design process. Feeling too comfortable led some to fall into a rabbit hole, becoming stuck in a repetitive loop within the same stage of their project. Relaxation appeared to be repeated

more at the beginning of the design process, meaning that students started with neutral, deactivated emotions compared to the negative, activated emotions at the end.

Boredom also appeared in both studies, but with noticeable variation. Its intensity dropped from 32.6% in the EmotionProbe study to 16.7% in the Emotion Tracker study, indicating reduced levels of disengagement students experienced. This shift could be attributed to differences in the nature of the design project, project interest, and the design experiences gained during the different study years. Hence, concerning the appearance of boredom, it always began to emerge during the middle stages of the design process.

The Emotion Tracker study presents two additional emotions, anger and enjoyment. Enjoyment wasn't included in the list of emotions in the first study; in contrast, anger was, but it wasn't reported by the students at all. Therefore, anger and enjoyment are absent from the EmotionProbe visualisation. Yet, their inclusion broadened the emotional insights. Enjoyment, in particular, emerged as the most intense emotion in the second study (27.5%). Compared to frustration, enjoyment exceeded frustration by a noticeable margin, highlighting a distinct shift toward more positive emotional engagement in the design process activity, despite frustration having previously reached the highest intensity.

One of the most significant findings of this research relates to the insights uncovered about anger, an emotion that is fundamental and basic to human experiences (Shahsavarani & Noohi, 2015). The emotion of anger emerges in the Emotion Tracker study as the least intense among all rated emotions, with an average intensity of just (14.7%). This low intensity, combined with its complete absence in the EmotionProbe Study, despite being included in the emotion list, strongly suggests that students do not perceive anger as a relevant or acceptable emotion within the context of the design process. Even when given the opportunity to rate this emotion, students consistently assigned anger a minimal significance. In some cases, students did not rate anger at all, assigning it a zero to explicitly indicate its absence. This perception was further reinforced through both the questionnaire responses and the semi-structured interviews, in which students frequently stated that anger does not belong in design or that they do not associate anger with their design process (see Figure 4-49, 4.4.2, p.252, and Table 4-7, 4.5.3.1, p.278). Such findings point to a broader emotional framing in which anger is missing from the emotional vocabulary of design process experiences. This not only highlights a blind spot in how emotional experiences are conceptualised in design disciplines but also raises important questions about the consequences of missing emotions that may, in some contexts, act as powerful catalysts for critical reflection, disruption, and change.

Concerning the design process activity emotions, the findings are:

- **Despite the notable intensity of frustration experienced during the design process,** students still reported the overall experience as positive and pleasurable. This suggests that negative emotions like frustration do not necessarily diminish students' broader sense of enjoyment and delight in the design process.

- **The high frequency of relaxation reported during the design process** appeared to contribute to delays in students' progress. Many students struggled to make decisive moves to the next stage of their project, often remaining within the more comfortable phases. This tendency indicates that excessive comfort may hinder momentum and decision-making in students' design progress.
- **Anger remains largely missing from students' design process accounts**, lacking a clear presence or articulation. Interestingly, both students and expert designers have connected anger to the concept of care. This suggests that the suppression or absence of anger may also reflect a limited emotional vocabulary around passionate engagement or productive investment and care in one's work.

### 5.2.1.2 Achievement Emotions

Achievement emotions are tied to individuals' achievements or performance in various domains, such as academic, work, or personal goals. As a subset of academic emotions, they are defined as emotions related to achievement activities and outcomes (Pekrun et al., 2002a). They play an important role in students' progress and self-directed goals. However, when observing the achievement emotion charts (Figure 5-2), a new emotional phenomenon emerges during the second study, one that is not traditionally categorised. The questionnaire responses and student interview statements offer varied interpretations of this phenomenon, suggesting the significance of the emotional experiences associated with the design process. Hence, this phenomenon warrants closer attention and can be situated within a less explored category of emotions: neutral emotions, which are often overlooked in emotional discourse (Ackerman, 2019).

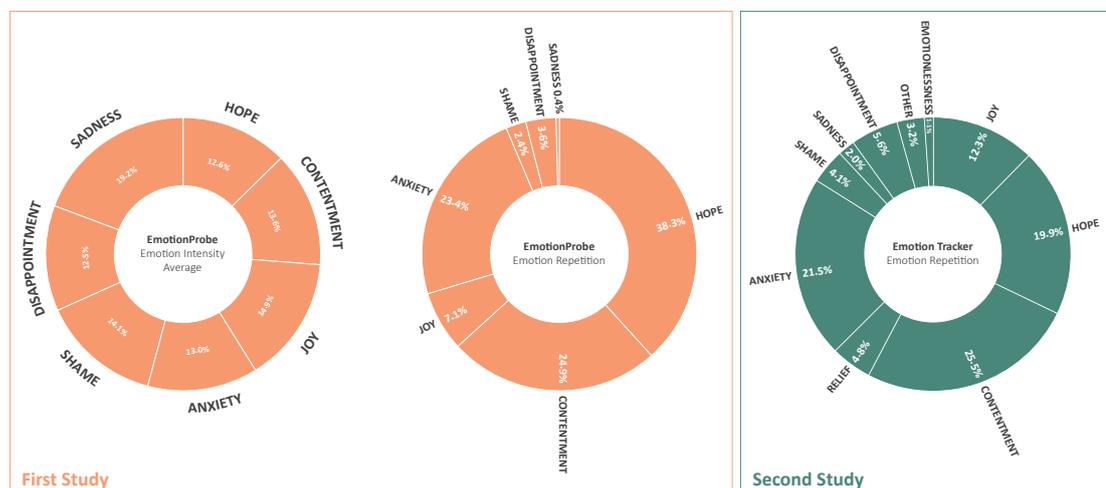


Figure 5-2. Design Students' Achievement Emotion Experiences During the Design Process. Research Exploratory Studies: Left, Study One; Right, Study Two.

Both studies consistently include achievement-related emotions such as hope, contentment, joy, anxiety, shame, disappointment, and sadness. However, the second study presents the new emotional state: emotionlessness. Further, the second study included relief as part of the emotional list set (see Table 3-3, 3.4.2.3, p.159). While relief accompanies less frequently experienced emotions, the emergence of emotionlessness is particularly noteworthy. Despite being minimally felt (1.1%), this state warrants attention due to its interpretive significance (see 4.4.4, pp.262). Students described emotionlessness as a consequence of emotional neutral experiences, either arising from negative emotions such as boredom, which then evolved into a 'fine', or from initially positive emotions like satisfaction, which eventually levelled out into a subdued form of contentment (see Figure 4-68, 4.5.3.1, p.275). In both cases, the outcome was a neutral emotional position, reflecting diminished emotional engagement with the design process and a decreased care for achievement or progress.

A shared pattern across both studies is the similarity in consistency of emotional repetition. Contentment, hope, and anxiety emerge as the most frequently reported emotions in both studies. Hence, students being content again draws attention to the relationship between contentment and emotional neutrality, leading to the emotionlessness position. Moreover, sadness, shame, and disappointment remain among the least repeated emotions. In contrast, a noticeable increase in the level of joy is observed in the second study, which may be attributed to the greater autonomy students had in choosing their projects and directions.

On another note, when considering both repetition and intensity aspects of the emotions, a noticeable pattern emerges: less frequently reported emotions tend to be more intense. For instance, sadness and shame follow this pattern: both were reported as highly intense (19.2%) and (14.1%) respectively, yet they were among the least frequently reported emotions. This supports the interpretation that certain emotions reflect isolated, personal experiences rather than recurring experiences within the design process. In contrast, despite being one of the most frequently experienced emotions in both studies, hope had a relatively low intensity score (12.6%) as shown in the first study. Anxiety is another emotion of note, maintaining a strong presence across both studies. Anxiety was reported at a high frequency (23.4%) in the first study and (21.5%) in the second study, yet, at a lower intensity (13.0%) in the first study, underscoring students' ongoing emotional demands in navigating the ambiguity, critique, and time constraints inherent in the design process journey. Meanwhile, contentment again occupies a middle ground, with moderate intensity (13.6%) and the highest repetition (25.5%), marking it as a stable and recurring emotion that potentially buffers the extremes of the emotional spectrum.

These findings reflect a broader trend in the achievement emotion dimension. Positive emotions become less dominant as students progress further in their projects, giving way to more neutral experiences, such as contentment, and eventually to emotional numbness. Later, negative emotions start to surface. This evolution suggests that students may emotionally adapt or become desensitised to the demands of their design journey. For tutors, these insights highlight the importance of creating environments that sustain a balance

between positive and negative emotions (Adler & Hershfield, 2012), helping them observe both while addressing signs of disengagement. Recognising this emotional progression allows for more responsive pedagogical strategies that foster resilience and re-engagement more specifically over the long-term design projects.

In relation to the design process achievement emotions, the findings are:

- **The second study introduced the emotional state of emotionlessness**, which reflects emotional detachment and a reduced sense of concern within the design process. This state appeared more frequently in longer-term projects, suggesting a connection between project duration and students' emotional engagement. At the beginning, students often felt emotionally comfortable and motivated, but they did not always account for the time demands of the project. As the workload increased, this lack of early time-awareness influenced their ability to manage the project effectively. Over time, this led some students to emotionally disengage or detach from their work, caring less about the project's outcome. Eventually, many were confronted with the consequences of their earlier decisions, which later became a source of frustration during the process.
- **A noticeable pattern emerges between the intensity and repetition of emotions.** Emotions that appeared more frequently tended to have moderate intensity, whereas those mentioned less often showed higher intensity. This suggests that certain emotions are highly individualised and tied to specific personal experiences, while more frequently occurring emotions reflect shared emotional responses among students during the design process.
- **A rise in emotional neutrality is observed during the design process**, with contentment remaining consistently high in frequency and moderate in intensity across both studies. This sustained presence of contentment suggests a gradual shift toward emotional neutrality, ultimately leading to the emergence of a state of emotionlessness. Over time, especially in longer design projects, this may signal a transition from mild satisfaction to emotional detachment, indicating potential disengagement as students move from active involvement to a more passive or indifferent emotional state.
- **The emergence of non-traditionally categorised emotional expressions**, such as the word 'fine', reflects a neutral experience with a subtle tendency toward negativity, suggesting a form of emotional disengagement or low-intensity dissatisfaction in the experiences of today's design students.
- **A need for a pedagogical responsiveness approach**, in which the emotional evolution across both studies points to a gradual adaptation or desensitisation. This highlights the importance of educational strategies that maintain emotional engagement and support student resilience throughout the design process.

### *5.2.1.3 Dimensional Emotional Experiences Across the Design Process*

The findings from both exploratory studies illuminate the variation and fluctuating emotional landscapes navigated by design students across various stages of the design process. Collectively, the results affirm that emotional experiences in the design process are not only prevalent but dimensionally layered in valence (pleasurable (positive) / unpleasurable (negative)), arousal (active/deactive), and neutral (encompasses a range of emotions situated in the middle of the felt experience spectrum) extent. Moreover, findings showed an unbalanced distribution of emotions throughout the design project timeline.

Accordingly, across both studies, a clear dominance of pleasant emotional experiences over unpleasant ones, with a balance between activating and deactivating emotions, was observed overall throughout the design process. Students experienced higher levels of positive emotions in the early stages, with a shift toward more negative emotions in the later phases of the design process. Contentment, hopefulness and relaxation, although differing in activation levels, were frequently reported, especially during the first half of the process, suggesting a combination of optimism and comfort during the discovery inquiry of the design process. Conversely, negative emotions such as anxiety, frustration, and boredom were present but generally less dominant, and they tended to emerge during critical decision-making moments, especially in the second half of the process, where the pressure of development, refinement, and production phases intensified with more focused decision-making. In particular, frustration increased steadily toward the final stages, indicating a rise in emotional strain linked to complexity, technical constraints, and deadlines. This shift mirrors a challenge transition from open exploration to focused problem-solving directions.

Moreover, the emergence of other emotions, consistently mentioned by students even when not explicitly included in the emotion list, highlights the experiential richness and specificity of emotions within the design process. This reinforces Scherer's (2009) proposition that emotions are as diverse as the patterns of appraisal that give rise to them, shaped by how individuals interpret and engage with particular situations. In this context, excitement appears as a central emotion associated with the exploratory and generative nature of the design process. The findings highlight that excitement is not incidental but intrinsically linked to the nature of the design process itself. Yet, excitement is characterised by a general state of alertness and readiness for action without a specific impulse (Stratton, 1928), Russell (1980) also, according to his identification, mentions a neutral excitement, which can be understood as excitement using the two dimensions approach. Another emotion mentioned by students, and more specifically during the interview, is jealousy. Jealousy is a multifaceted emotion that is strongly connected to the design field (Rodgers & Bremner, 2021) and can drive ambition while simultaneously creating feelings of competition and insecurity. This jealousy is rooted in a historical context that intertwines with cultural notions of creativity and is linked to the desire for recognition and ownership of ideas, often leading to a competitive atmosphere and serving as a means of expressing energy and the creative process (Nelson, 2009).

Additionally, the frequent use of the word 'fine' by students points to a specific emotional experience not typically captured in traditional emotion categories. From the students' perspective, 'fine' often described a negative-neutral experience, neither actively distressed nor positively engaged, but rather a passive response, often coinciding with moments of reduced motivation and care within the design process. This aligns with Frijda's (1986, 1987) notion that while there may not be universally basic emotions, there are prototypical emotional families that capture common evaluative experiences. Moreover, Lazarus's (1982) appraisal theory further supports this interpretation by emphasising how emotions arise based on personal relevance and perceived coping potential (Lazarus, 1991). In moments when students felt 'fine', they may have appraised the situation as lacking care or personal meaning, resulting in emotional disengagement.

Moreover, aligning with prior research, examining students' emotional experiences during the design process using the dimensional and categorical perspectives proved to be beneficial. This usefulness came in two forms:

- First, focusing on the repetition of emotions offers better insights into the collective emotional landscape experiences and common patterns experienced in students' design processes.
- Second, examining intensity was more beneficial for understanding that certain emotions are individual emotional experiences and have personal connections to specific moments in the process.

As a result, if the goal is to explore shared emotional phenomenon and identify commonalities and differences across students, repetition is a more useful metric. If the aim is to dig deeper into students' personal, subjective emotional experiences, intensity provides more valuable insights. This aligns with Haidt and Keltner's (1999) suggestion that various dimensional combinations can effectively represent distinct emotional states and experiences.

As reported by several students in the exploratory studies conducted during this research, participating in the research raised their awareness of how emotions influenced their design process, often without their conscious recognition, until they began to report those emotions. Through this tracking, students became more attuned to moments when they avoided or suppressed emotional responses, realising how such patterns affected their motivation and engagement. This reflective process enabled them to better understand and regulate their emotions, ultimately supporting their emotional well-being and the progression of their design processes. These findings align with previous research highlighting how academic achievement and personal growth are closely tied to emotional awareness. Emotion, in this context, functions not only as an experience but also as a tool that supports flexible problem-solving and the development of self-regulation skills and growth (Pekrun et al., 2002a; Pekrun & Stephens, 2012).

## 5.2.2 Process Stages

### 5.2.2.1 Design Process: Stage Distributions

The role of emotions in the students' design process was observed to have a significant influence on their motivation and progress. Students reported that their emotions affected how they managed their design process, which in turn influenced their decisions when transitioning from one stage to the next. Figure 5-3 presents a comparative analysis of student engagement across different stages of the design process, based on the two separate exploratory studies. Hence, the study spans on different periods. The first study, with EmotionProbe, has a one-month design task, while the second study, Emotion Tracker, reflects the distribution throughout a year-long final design project.

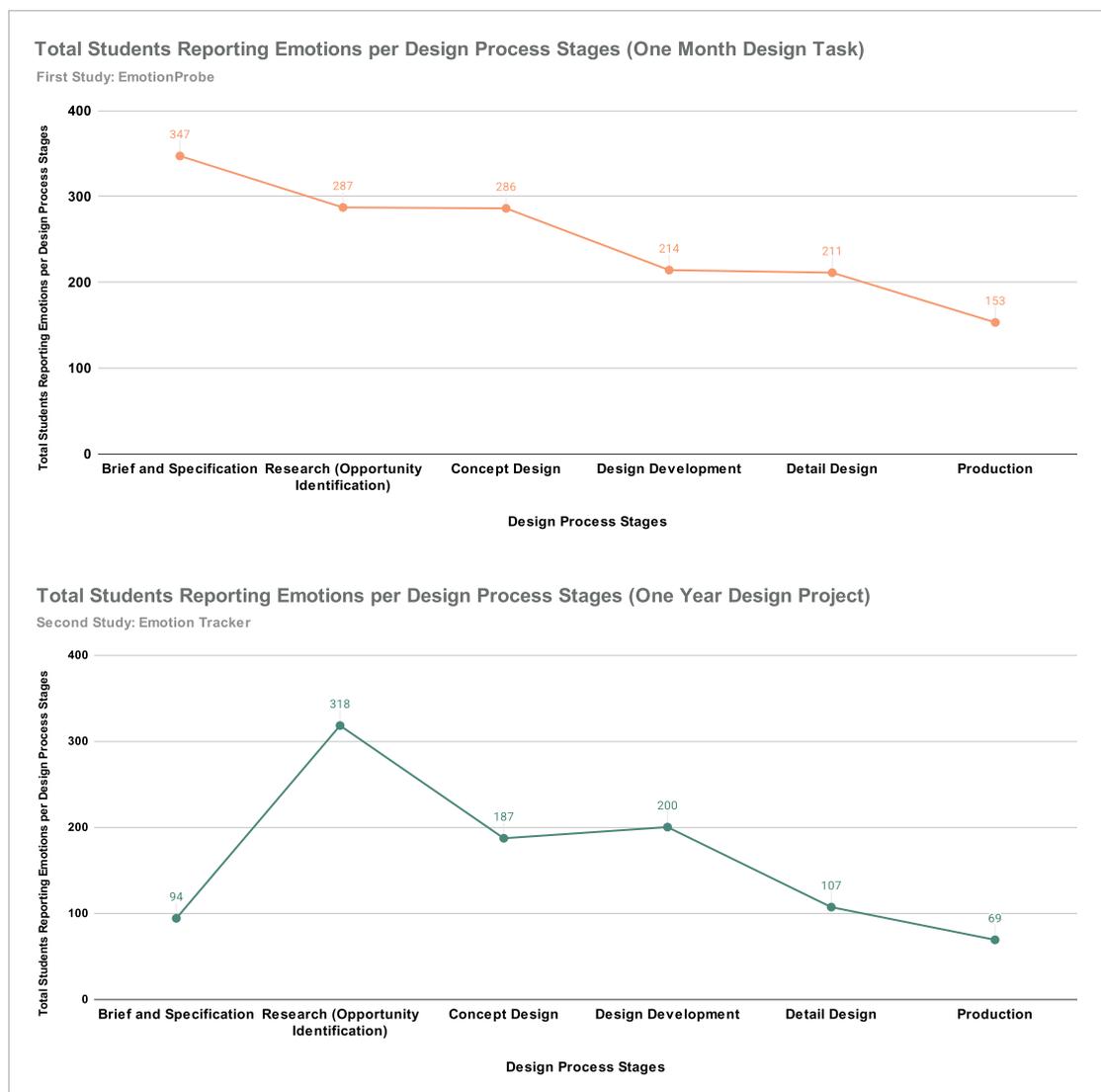


Figure 5-3. Student Engagement Across Design Process Stages in Short-Term and Long-Term Projects.

In both studies, student engagement is higher in the early stages and drops off toward the end of the design process. This general trend suggests that the initial phases, especially the

brief and specification and research stages, attract the most concentrated student activity. By contrast, fewer students are involved in the later stages, such as detail design and production, possibly due to the natural progression of the process, where increased focus and clearer direction present greater challenges for students.

Despite this shared pattern, the two studies differ notably in how student engagement evolves. In the one-month design task, the number of students is highest during the brief and specification stage (347), followed by a steady decline through the research stage (287), concept design stage (286), and so on, dropping to (153) students by the production stage. This linear decline suggests a structured and time-compressed project, where students collectively begin at the same point and gradually disengage as the project advances. The short timeframe likely demands quick transitions, leaving less room for overlap or extended exploration during the different stages. In contrast, longer-timeline projects give students more space for procrastination and allow them to remain in the comfort zone of research and exploration, without the time pressure to make decisions quickly.

Another important consideration emerging from the data is the distinction between students being given a design brief versus generating one themselves. This difference likely influences the level and timing of student engagement across the design process. In the one-month project, where students were more likely given a predefined design brief, engagement peaks immediately at the brief and specification stage and then steadily declines. In contrast, the year-long project shows a different scenario. Fewer students begin with the brief and specification stage (94). Still, there was a dramatic increase in the number of students participating during the research phase (318), followed by a decline during concept design (187). Interestingly, there is a slight comeback in student activity during design development (200), before the numbers drop again through detail design (107) and production (69).

This suggests that when the brief is externally provided, students can begin working right away with clear direction, prompting early concentration of activity. In contrast, the year-long project showed a delayed but sharp increase in engagement during the research stage, implying that students had been actively involved in crafting their own project briefs. In such cases, students spend more time investigating the context, identifying opportunities, and refining the problem space, which naturally shifts their peak engagement into the research phase. Interview data further revealed that creating the brief can come with uncertainty, as some students reported feeling less confident about the direction they had chosen themselves. As a result, they tend to spend extended periods in the research stage, repeatedly questioning whether they have gathered enough insight to justify moving forward. This lack of confidence can lead them into a loop of continual exploration, where the search for more information delays their progression into the next phase of the design process. This pattern indicates that in longer projects, student engagement is less uniform and more fluid and iterative across stages. The sharp rise in the research stage suggests that students may enter the project at different times or become more active once the brief has been interpreted and research opportunities become clearer. The slight increase during

design development also implies that some students re-engage once tangible design work begins.

Overall, the figure indicates that student engagement is concentrated primarily in the early stages of the design process. Still, the shape and consistency of this engagement differ according to the project's duration. Yet, a tendency to remain longer in the earlier, more comfortable stages of the design process, such as research and ideation, rather than advancing into the more technical and demanding phases of development and execution, is the case. While they expressed enjoyment in the act of making, many consciously or unconsciously delayed transitioning into these later stages due to emotional challenges. These challenges, shaped by a combination of internal factors (e.g., fear of failure, self-doubt, lack of confidence) and external pressures (e.g., unclear expectations, time constraints, critical feedback), often create emotional resistance to progress.

In addition, in shorter, more intensive tasks, students move more uniformly through the process, with steady transition over time. In longer projects, engagement is more variable and responsive, likely influenced by individual pacing, shifting responsibilities, or phases of motivation and clarity. This behaviour reflects deeper patterns identified in the literature on design decision-making. As Hansen and Andreasen (2004) noted, design decisions are complex and heavily influenced by one's understanding and navigation of both the design process and its goals. In the cases observed, emotional discomfort appeared to distort this understanding, leading students to rationalise prolonged exploration as necessary preparation rather than recognising it as a form of avoidance. Such avoidance aligns with Anderson's (2003) perception of decision avoidance and Kurien's (2014) notion of analysis paralysis, two behavioural loops that designers often fall into (McSweeney, 2019). In the first, students delay making choices, often masking underlying fear or uncertainty by seeking more input or reassurance. Second, they become stuck in cycles of over-analysis, continuously gathering information or refining ideas without moving toward implementation. Cerejo and Carvalhais (2020) elaborate that this deferral of decision-making often serves as an emotional coping mechanism, where requests for further input mask a fear of commitment or error.

#### *5.2.2.2 Design Process: Emotional Trends Across Six Stages*

As the analysis in chapter four shows, the overall emotional journey across the design process is characterised by early optimism, mid-process neutrality, and end-stage emotional duality. Figure 5-4 and Figure 5-5 illustrate these emotional trends across the six stages of the design process.

First, Figure 5-4 presents the proportion and intensity of emotions reported by students according to the first study, showing that relaxed, hopeful, and contentment emotions were most prominent, particularly at the beginning of the design process. In contrast, frustration, anxiety, and boredom increased in the second half of the process, especially during the development and more detailed design stages. However, the overall intensity suggests that the emotional experiences become more intense toward the end of the process.

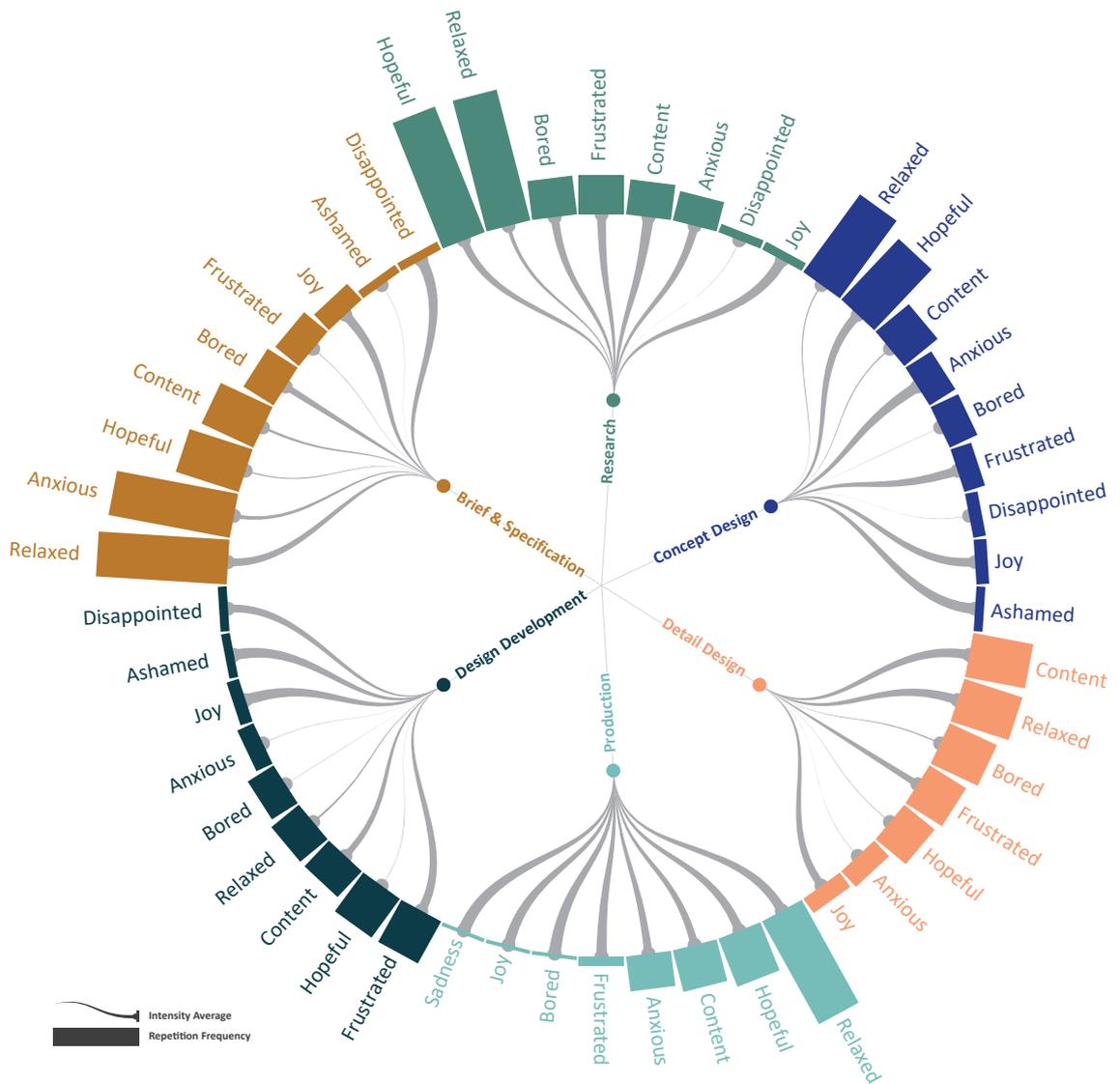


Figure 5-4. EmotionProbe: Emotional Trends Across Six Stages (Repetition and Intensity) Representation.

A closer look at each stage of the design process reveals a shifting emotional landscape. During the brief and specification stage, positive emotions such as relaxation, hopefulness, and contentment were most prominent, indicating that students often begin with a sense of optimism and excitement. However, the presence of anxiety also suggests early apprehension related to expectations and understanding the nature of the brief. In the research stage, positive emotions continued to dominate, with a slight increase in hopefulness over relaxation, while anxiety dropped notably as students became more comfortable with the process. During the concept design phase, positive emotions remained prevalent, with a notable appearance in contentment. Entering the second half of the process, beginning with design development, frustration dominated, though hopefulness and contentment remained high. In the detailed design stage, contentment became the dominant emotion, followed by boredom and frustration. Finally, in the production stage, students experienced higher levels of relaxation and hopefulness, reflecting a sense of closure and resolution.

Secondly, the observation of Figure 5-5, which visualises students' emotional responses across the six stages of the design process according to the second study, reveals another evolving emotional landscape. Hence, this visualisation includes two types of emotional data: emotions represented by coloured bars and without line thickness indicate the frequency of reported emotions, while those marked with various grey line thicknesses and a grey circle at the end represent intensity-based emotions, highlighting the strength of the emotion felt by students.

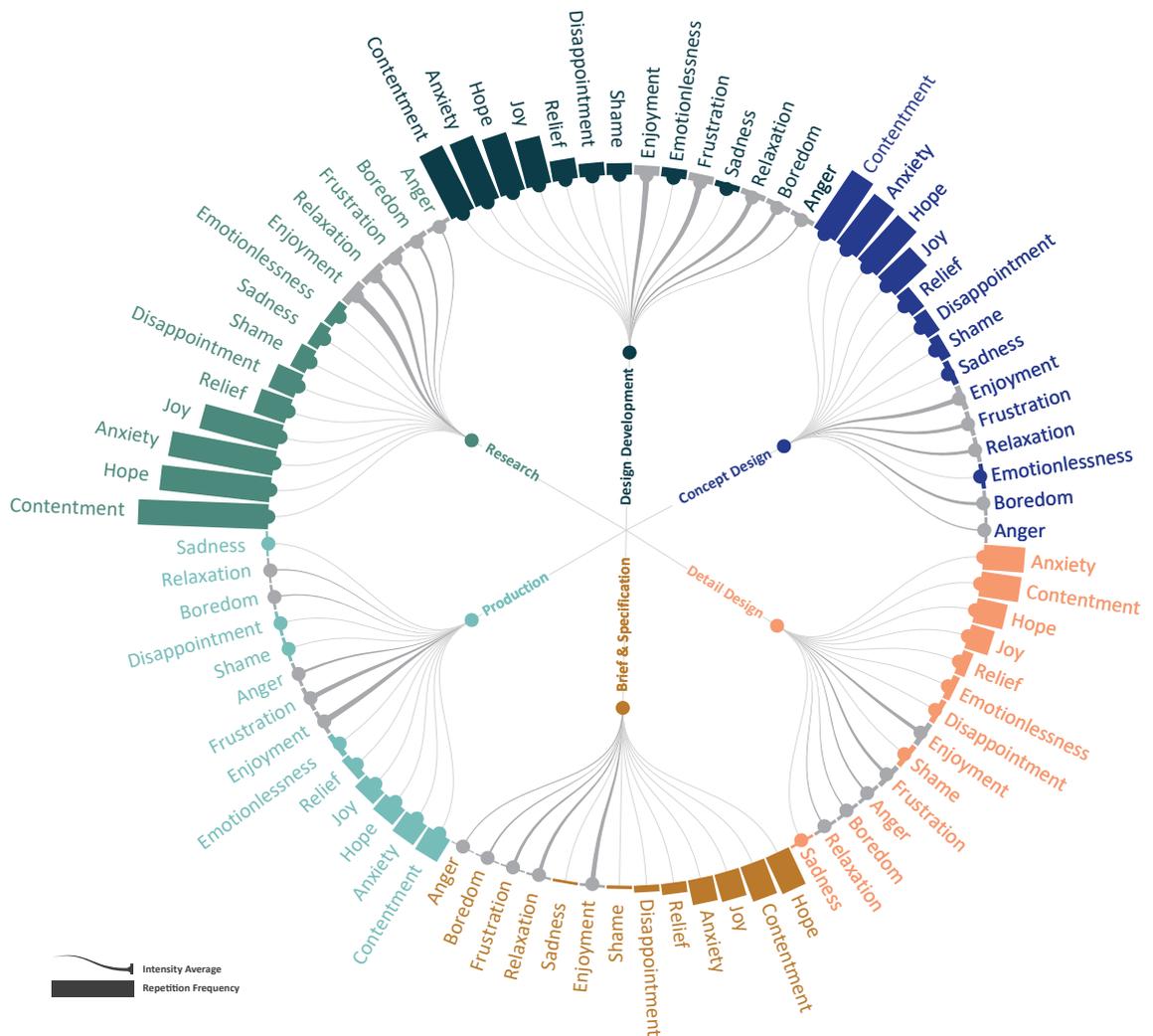


Figure 5-5. Emotion Tracker: Emotional Trends Across Six Stages (Repetition and Intensity) Representation.

At the beginning of the process, particularly during the brief and specification and research stages, positive emotions, including hope and contentment, were most frequently reported. This suggests that students enter the design process with a general sense of optimism and excitement, although mild anxiety is also present. As the process progressed into the concept design and design development stages, contentment remained a dominant emotion. However, a noticeable rise in anxiety emerged, marking a shift in the emotional experiences. These stages represent an emotional peak, likely due to the increasing challenges of

transforming abstract ideas into workable concepts, coupled with the pressure of making critical decisions that define the direction of the final outcome. This often hinders students' decisions to progress confidently into these stages, leading many to prefer staying longer in the research phase, where they feel more comfortable and face fewer emotional challenges. As a consequence, anxiety dominated the detailed design stage, often alternating in prominence with contentment. However, this pattern shifted in the production stage, where contentment surpassed anxiety by the end of the process. While contentment and hope were frequently reported, they coexisted with persistent levels of anxiety. The simultaneous presence of relaxation and anxiety during the production stage underscores the emotional tension students experienced, feeling both relieved to be nearing completion and anxious about the final outcomes and evaluation.

An interesting trend emerges when examining the intensity of emotions: enjoyment consistently appeared as the most intensely felt emotion, surpassing even frustration, relaxation, boredom, and anger. In contrast, anger was the least intense emotion across four stages, though its intensity increased toward the end of the design process. This suggests that while anger was not a dominant emotion overall, it may have built up during the final stages alongside frustration, which was the second most intense emotion after enjoyment, potentially reflecting accumulated stress or dissatisfaction.

### *5.2.2.3 The Journey Pattern*

Findings from the first study reveal a clear emotional trend across the six stages of the design process. In the first study, students tended to begin with high levels of relaxation, followed by a rise in hopefulness as they engaged more with their projects. As the process progressed, emotions gradually shifted toward a more neutral experience, accompanied by increases in contentment and the emergence of boredom. A peak followed this in frustration during the more demanding middle stages. However, contentment rose again as students approached completion. By the final stage, emotional responses returned to a more relaxed experience, indicating a sense of resolution and closure. Similarly, findings from the second study reveal two parallel trends, one based on the repetition of emotions and the other on emotional intensity. Students began with frequent experiences of hope and contentment, with hope slightly more prominent in the early stages. As they progressed, contentment became the dominant repeated emotion, gradually paired with increasing levels of anxiety. This pairing persisted through the middle and later stages. In terms of intensity, enjoyment remained consistently the highest intensity emotion across all stages. In the earlier stages, it was most intensely felt alongside relaxation, reflecting a sense of ease and pleasure at the start of the process. However, from the concept phase onward, relaxation gave way to frustration as the most intensely felt emotion paired with enjoyment.

Figure 5-6 illustrates the emotional journey of design students throughout the design process. By highlighting the most experienced emotions at each stage and the number of students represented in both studies, the figure reveals a consistent pattern in students'

emotional experiences despite the differences in the design projects and the students' groups participating in the study.

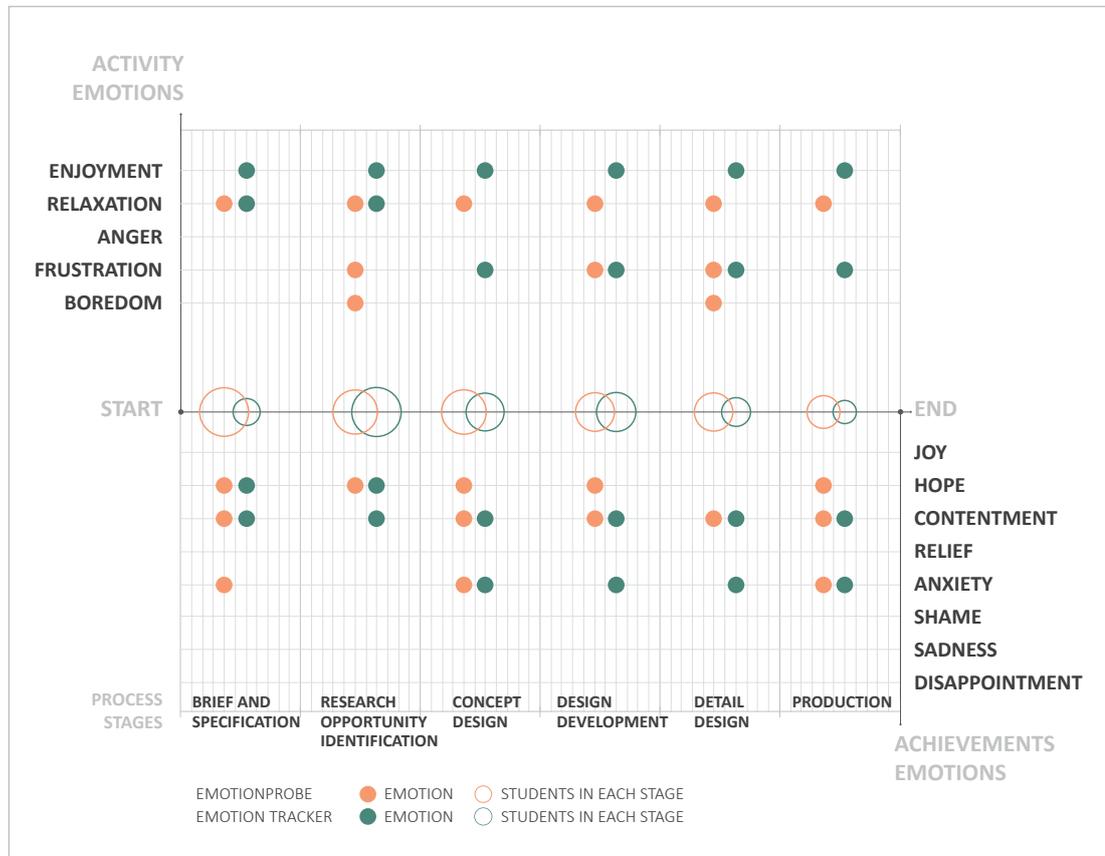


Figure 5-6. Design Students' Journey Pattern.

The emotional journey pattern reveals a noticeable imbalance in two aspects: the emotional experiences and student engagement across the design process. Positive emotions dominate the beginning stages, while heightened negative emotions mark the later stages. In contrast, the middle stages are characterised by more neutral emotions, suggesting a dip in the emotional experiences. This imbalance is further reflected in student distribution: the number of students actively engaged is highest in the first two stages, then declines significantly as the process progresses. This suggests that students tend to spend more time in the initial phases, where positive emotions and a sense of comfort are more present, while giving less attention to the middle stages, concept development, defining direction, and refining details, which are more challenging. The data points to a need for greater activation and emphasis during the middle stages of the design journey, both in terms of time investment and emotional resilience. Creating a balanced emotional experience is important for maintaining a dynamic between positive and negative affect. Research and observational studies indicate that neither sustained positivity nor persistent negativity fosters optimal psychological well-being. Instead, the flexible interplay between both predicts greater resilience and overall mental health (Adler & Hershfield, 2012; Touboul et al., 2017).

## 5.3 Design Process Emotion Phenomena

### 5.3.1 *The Design Neutral Schema: An Emergent Emotional Phenomenon*

Integrating data from emotion reporting, tracking, interviews, and questionnaires allowed a comprehensive understanding of the significant emotional experiences students encountered throughout their design journey. This multifaceted analysis uncovers the patterns, transitions, and interconnections between the emotions, eventually leading to the articulation of what this research refers to as the Design Neutral Schema. Based on Buddhist discourse, neutral emotions are understood differently from those typically defined by clear valence or arousal levels. Rather than being distinctly pleasant or painful, neutral emotions occupy the middle of the emotional spectrum; they represent a zone of experience where affective categorisation is unclear, neither clearly positive nor negative (Anālayo, 2017).

From the outset, the first study offered early indicators of this phenomenon. A small group of students reported no emotional experience during parts of the design process, claiming they “felt nothing”. Though initially a minor observation, this pointed toward a significant emotional state that would resurface more clearly in later stages of the research.

In both studies, certain emotions, contentment, boredom, satisfaction, and 'fine' emerged consistently and were often concentrated in the middle phases of the design process. These emotions, while not explicitly intense, represented a unique emotional pattern. Students frequently described contentment and 'fine' as emotionally flat. Contentment, on one hand, was often linked to satisfaction. Thus, satisfaction is not simply an emotional reaction, but a broader affective state rooted in experiences of comfort and relief (Tutton & Seers, 2003). In contrast, 'fine' was connected to boredom, which is caused by routine, disengagement, and a lack of care towards the project, impacting the students' design process. Hence, boredom reduces engagement and hinders learning (Pekrun et al., 2010) by keeping students in their comfort zone, where challenges are minimal and motivation declines (Page, 2020; Yerkes & Dodson, 1908). Despite their superficial neutrality, students' interpretations of these emotions diverged; some perceived them positively, while others perceived them negatively. This duality marked them as neutral experiences, emotionally ambiguous but experientially consistent.

Boredom, peaking in the latter part of the middle stages, and 'fine', frequently cited in the second study, contributed further to this emotional flattening. Students described the word 'fine' in ways that suggested detachment: a coping response to repetition or phases of stagnation in the design process. These expressions were not simply emotional low points but rather moments where emotion itself seemed to dissolve into numbness states.

Notably, the questionnaires revealed that 63.3% of students experienced emotional disengagement (see Figure 4-57, 4.4.4, p.262), which they often equated with neutrality or

numbness. Moreover, students actively advocated for terms like 'fine', 'nothing', or 'neutral' to be included in the emotion reporting list, suggesting a shared need to articulate and draw attention to these terms as part of the emotional categorisation. These responses indicate that emotional neutrality is not an absence of emotional experiences but a recognisable experience from the students' point of view, which can lead them to emotional disengagement from the process. The peak of emotional neutrality during the design process is what this research refers to as the Emotionlessness State.

What emerges from these interlinked findings is a phenomenological emotional schema that this research identifies as the Design Neutral Schema. This is not a singular emotion but a transition along an emotional continuum where emotional presence gradually fades. It reflects a convergence of subtle emotions, contentment, satisfaction, boredom, and 'fine' into a state of emotionlessness, where students feel neither positively nor negatively engaged. Importantly, this neutral experience is not emotionally empty. It is layered with shifting sentiments and affective qualities. For example, contentment carries a positive neutrality tied to comfort and hesitation, while 'fine' signals negative neutrality driven by detachment or routine. These subtleties reveal how neutrality in the design process can stem from different emotional paths, each contributing to the larger experience of emotional disengagement.

The Design Neutral Schema, as visualised in Figure 5-7, is thus a result of multiple neutral emotional experiences converging into a common experiential zone. It is a composite phenomenon shaped by a satisfaction and boredom at the beginning. It becomes particularly pronounced during comfort, repetitive, or more demanding design phases, where emotional activation decreases, and students shift into escaping rather than feeling. Then their emotional experiences gradually shift toward more neutrality, expressed through contentment or 'fine'. Notably, the Design Neutral Schema falls under the deactivation dimension, where students exhibit reduced care, passion, and diminished motivation to progress in their design process.

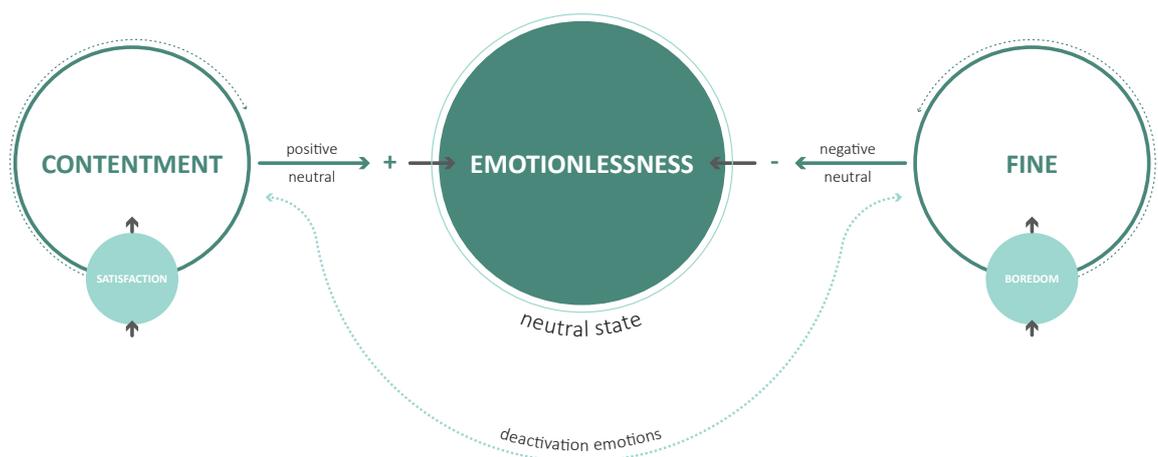


Figure 5-7. Design Neutral Schema.

However, the argument here can be whether the word 'fine' is considered an emotion or not. Upon reviewing the literature, no empirical psychological or computational studies were found that specifically investigate how 'fine' functions as an emotional expression, with only qualitative notes (Simpson et al., 2021) and corpus analysis (Jucker, 2017) addressing 'fine' uses as a potentially insincere or masking response. Furthermore, computational resources and sentiment analysis models treat 'fine' merely as an ambiguous term without examining its pragmatic or contextual expression. Accordingly, Simpson et al. (2021) discussed 'I'm fine' as a default greeting and emotional mask in English, emphasising cultural norms and the need for authentic self-expression, but provides no experimental or survey data. Furthermore, Jucker (2017) traces the phrase's evolution from sincere health reports to formulaic greetings and observes increased routinisation and possible insincerity, but his research didn't include any psychological experiments. While various sentiment analysis tools and deep learning models analyse the word only as part of general vocabulary, not as an emotional signal, with no contextual analysis or dialogic considerations (Chaudhary et al., 2023; Demszky et al., 2020; Mohammad, 2018; Mohammad & Kiritchenko, 2015).

On one hand, few studies have given direct attention to 'fine' as an emotional expression, and there is a noticeable lack of experimental or computational research exploring 'fine's dimensions. On the other hand, existing computational and sentiment analysis approaches often treat the word 'fine' as a static or generic term, without acknowledging the term 'fine' pragmatic or psychological significance. Again, this aligns with Anālayo's (2017) description of emotions that occupy the middle of the emotional spectrum as 'indifferent' or 'neutral'. This gap highlights a pressing need to understand and contextualise the use of 'fine' across different disciplines, particularly in how 'fine' is expressed and experienced during the design process.

This research presents an experimental study that illustrates 'fine' as a significant emotional experience that emerges during the design process. Student explanations and suggested definitions reinforce the idea that the term is ambiguous; however, the contribution of this study lies in identifying that, within the context of the design process, 'fine' tends to function as a negative neutral experience. While not overtly negative, it reflects emotional disengagement, detachment, or stagnation, an affective experience with potentially concerning implications for students' design momentum.

This emergent of the Design Neutral Schema opens new avenues for understanding the emotional dynamics of design practice. It highlights the need to acknowledge, interpret, and question the moments of emotional flattening as part of the rhythm of students' design journey.

### 5.3.2 Promoting Anger in the Design Process

The findings from this research reveal significant emotional patterns in design students' journey. The pattern exhibited by students revealed emotional imbalance and uneven progression through the design process stages, underscoring the need for a more balanced, motivated, and emotionally engaged design experience.

The main proof of imbalance is that, firstly, the initial stages were marked by high positivity and enthusiasm, with students often choosing to remain in these phases longer than necessary. This reluctance to transition to more advanced, skill-based stages was often due to the emotional challenge of decision-making and developing a defined design direction. Toward the end of the process, students entered a frustration phase, particularly when confronting the pressure of finalising and justifying their work. This build-up of anxiety and emotional strain was not effectively managed or leveraged, leading to a pattern of emotional stagnation or collapse rather than constructive transformation. Secondly, the research identified a notable emotional 'neutrality' or detachment during the middle stages of the design process. Many students reported a lack of care and emotional activation at this stage, making it difficult to maintain engagement with their projects. This emotional disengagement, characterised by escaping, appeared to be a defensive response to stress, uncertainty, or fear of failure, resulting in the loss of the emotional drive necessary to push through challenging decisions. Thirdly, perhaps most revealing, is the near-complete absence of anger as a recognised or utilised emotion within the students' design experiences. Anger was consistently rated as the least relevant. Students often dismissed anger as inappropriate within the design context. This exclusion is striking compared to the broader literature, where anger is frequently acknowledged as a powerful emotion that provokes reflection, boundary-pushing, and action-oriented change (see 5.3.2.2, pp.333).

Given these findings, this research strongly recommends rethinking and promoting anger as a productive emotion during the design process for design students. Hence, research and literature provide strong conceptual, empirical, and case-driven evidence that anger, especially when framed as moral, agentic or compassionate, is a potent driver of productive change in design, organisational, and social innovation domains, with key mechanisms and boundary conditions elucidated across multiple studies. Consequently, understanding the productive role of anger as an emotion has become an important focus in interdisciplinary research, spanning psychology, organisational studies, social movements, and, more recently, creative domains. Historically, anger has often been cast as a disruptive or pathological emotion (Simola, 2009). Still, a growing body of evidence challenges this view by demonstrating that, under specific conditions, anger functions as a catalyst for constructive change (Stickney & Geddes, 2014; White et al., 2023).

### 5.3.2.1 Anger and Frustration

Students often experience high frustration during the process and lack the motivation to change the situation. As a result, two main findings emerged basically from the questionnaire and the interviews:

- The inability to confront emotions and take proactive steps to solve the problem.
- Avoidance (or 'runaway') behaviour, such as engaging in other activities, can lead to procrastination. As tasks are delayed, frustration builds up, becoming more intense at the end of the stages.

Negative emotions such as stress, anxiety, fear, and frustration are common throughout the design process and can significantly influence a designer's performance. While a certain level of mental stress can stimulate creativity, excessive or unmanaged stress often leads to frustration, diminishing both thinking and productivity (Ashari et al., 2024). Yet, anger, when understood and channelled effectively, can serve as a proactive force that helps students overcome frustration and sustain motivation before they reach a point of emotional shutdown or disengagement. According to Johnson and Connelly (2014) anger in feedback situations is a valuable signal that highlights dissatisfaction and the need for adaptive change to prevent repeated frustration. When students signal that their progress is blocked, anger can indicate a deep investment in their goals. Consequently, the functional goal of anger is to regain control or remove obstacles, which can lead individuals to fight against opposing ideas persistently, promoting creativity and problem-solving (Yang & Hung, 2015). Recognising and validating anger during the design process stages can allow students to reframe it not as a setback but as an opportunity to assert their needs and clarify their intentions.

Building on the frustration-aggression hypothesis, Berkowitz and Harmon-Jones (2004) argue that anger often arises from perceived obstructions to important goals. In design education, for instance, students may become angry when a design vision is misunderstood or constrained by external critiques. Rather than suppressing this response, tutors can encourage students to explore the source of their anger: What value, idea, or ambition feels threatened?. This process transforms anger from a reactive emotion into a motivational one, fuelling persistence and assertiveness. Additionally, Marcus (1978) emphasises that anger can give voice to frustrations that might otherwise remain unspoken, especially in environments where emotional vulnerability is discouraged. In the design studios, inviting students to express anger productively legitimises their emotional labour and fosters a space where difficult emotions are seen as part of the learning process rather than a failure of self-control.

In this way, anger becomes not just a reaction to frustration, but a tool to confront and resolve it, allowing students to act before they are overwhelmed. Yang and Hung (2015) states that anger can enhance problem-solving and goal achievement by mobilising energy, boosting motivation through increased dopamine and noradrenaline levels, and expanding working memory capacity to support creative performance. Tutors can help students remain engaged,

reflective, and motivated throughout the design process by recognising anger as a signpost for unmet needs and obstructed goals.

### 5.3.2.2 *Why Incorporate Anger?*

Multiple studies conceptualise anger, particularly moral (Hechler & Kessler, 2018; Lomas, 2023) or agentic anger (White et al., 2023), as an approach-oriented emotion triggered by perceived injustice, characterised by focused attention and increased motivation to address norm violations (Lindebaum & Gabriel, 2016; Lindebaum et al., 2017). These frameworks suggest that anger acts not simply as an arousal mechanism, but as a diagnostic signal and energiser that can mobilise individuals and groups toward creative problem-solving, organisational voice, and collective action (Lindebaum & Gabriel, 2016). Lindebaum and Geddes (2016) delineate the components of moral anger, arousal, moral appraisal, concern for others, and readiness to act, arguing that this form of anger is crucial for corrective behaviours in organisations and group contexts (Lindebaum et al., 2017).

Furthermore, empirical research supports these conceptual claims. Laboratory and neurobehavioral studies have demonstrated that induced agentic anger is associated with increased risk-taking, reward sensitivity, and activation of neural circuits tied to incentive motivation, thus underpinning actions aimed at challenging the situation (White et al., 2023). In organisational contexts, studies reveal that expressing anger in response to perceived wrongs can promote problem identification, learning, and trust, provided the anger is norm-based and addressed constructively (Stickney & Geddes, 2014). Team-level studies further indicate that anger displays can prompt integrative, problem-solving behaviours when contextual factors, such as regulatory fit and social support, are favourable (To et al., 2021). In contrast, suppressing or mismanaging anger or being silent generally correlates with unfavourable outcomes (Kirrane et al., 2017; Stickney & Geddes, 2014).

Within design and social innovation, research illustrates how practitioners deliberately harness anger and moral shock to frame problems, mobilise engagement, and generate new solutions. For instance, studies of memorial and campaign design have shown how emotion-laden storytelling and visuals are used to transform public indignation into sustained collective involvement (Barberá-Tomás et al., 2019; Hourcade, 2021). Similarly, case analyses in disability advocacy underscore the mechanisms by which moral anger facilitates stakeholder aggregation and coordinated action toward systemic change (Kulkarni, 2024). Empirical work in creative domains suggests that anger can support the initial identification of problems in the design process, especially when buffered by social support. However, anger's role in subsequent ideation may depend on contextual factors (Costa et al., 2015; Da Costa et al., 2018).

Furthermore, anger has been used productively across diverse fields such as art, social activism, video gaming, and sports, where it becomes a platform for expression, motivation, and transformation. In the art world, anger is productively explored through creative processes, turning it into a source of engagement and curiosity (Wagner et al., 2016). Artists like Virginia Woolf and Elizabeth Robins transformed personal and collective anger into powerful critiques of social injustice, using artistic expression to challenge norms and surface deeper emotional truths (Marcus, 1978). Such creative practices allow individuals to reframe anger as a resource rather than a liability, promoting empowerment and self-understanding (Kaplan, 1996). Moreover, in the social field, anger emerges as a moral force. Rather than inciting harm, anger reveals ethical violations, sharpens sensitivity to injustice, and drives collective action (Gubka, 2024; Silva, 2024). Historical and contemporary social movements have shown how anger, when channelled constructively, leads to peaceful protests and meaningful reform (Marcus, 1978). Here, anger is less about punishment and more about recognising wrongs and pursuing changes (Kleinschmidt, 1967).

Even in competitive contexts such as video games and sports, anger is recognised for its instrumental value. Players engaged in high-stakes gaming reported that anger increased their sense of usefulness and performance (Netzer et al., 2015). Similarly, in sports, anger enhances physical capabilities when aligned with aggressive, forceful tasks, often outperforming emotions like happiness, which signal contentment and reduce drive (Woodman et al., 2009).

Together, these examples illustrate that anger, when given the right context and direction, is not merely a destructive impulse but a powerful engine of change and motivation. It enables individuals to express, confront, and change their realities, demonstrating their critical and functional role in personal growth and collective progress. Therefore, using anger within design educational context will enhance the students' experiences and boost their motivations.

## 5.4 Research Recommendations

This research insights drawn from the exploratory studies, lead to a central perspective that **the starting point for addressing the emotional imbalance in students' design process lies in opening up a conversation about cultivating angrier design students.** The idea presents an opportunity to rethink design as a dynamic force that moves beyond seeking agreement but challenges established norms, questions the status quo, and fosters a more critical approach to design education and practice. This is not about promoting aggression but encouraging students to include, recognise, express, and harness anger as a positive, caring, and motivating force within their design process. By initiating this dialogue, the research challenges the prevailing norms in design education, where emotional expression, particularly difficult emotions like anger, is not discussed. Therefore, Highlighting how and why we should make space for such conversations marks a critical first step toward shifting those norms and rebalancing the emotional dimensions of design learning and practice.

Given that, this research suggests that using anger as a positive motivator can enhance design students' emotional journey and progression in the design process. Therefore, the Angry Design workshop aims to help the researcher test and gain a more comprehensive understanding of such suggestions. This includes a conversation about design participants' opinions and experiences with anger, whether they are involved in design academically or as practitioners. Accordingly, this section will highlight the rethinking and incorporation of anger during the design process as strategy within design education.

### *5.4.1 Recommendation One: Rethinking Anger as a Design Strategy*

The conventional perception of anger as a disruptive or negative force (Lindebaum & Gabriel, 2016) often leads to its suppression in professional and educational settings. The Angry Design workshop challenges this narrative and suggests a radical rethinking: anger, when understood and guided intentionally, can be a positive driver of change. As a result of the thoughts and discussion towards anger, the most important strategy for rethinking anger within design is as follows:

#### **1. Reframing Anger as Emotional Energy**

Viewing anger not as destructive, but as a form of emotional determination, a fuel that, when recognised and channelled, can power deeply purposeful design work. By acknowledging that anger often arises from personal values and ethical concerns, students can connect more authentically to their motivations and process.

## **2. Creating Structures for Constructive Engagement**

Strategic frameworks are needed to help students integrate anger into their design processes. These include reflective practices that allow students to explore the roots of their anger, design methods to guide emotional intensity, and design exercises that use this anger as a motivator rather than a hindrance. A supportive and open environment is critical for this approach to succeed. Students should be able to engage in open dialogue, express emotional honesty, and normalise emotional expression. When not seen as taboo, anger can become a point of connection, mutual understanding, and collective empowerment. If the design tutors can recognise students' anger, they can help students learn how to harness this powerful emotion to enhance their design process. There is also a need for tutors to develop a deeper understanding of anger.

## **3. Encouraging Dissent and Reflection**

Anger should not be isolated from the students' experiences. Sharing emotional responses within design spaces leads to more grounded, socially conscious outcomes. Dialogue about how to turn tension into insight and disagreement into opportunity is the key. Encouraging anger in design invites a shift from passive students to critical dissent, challenging the consensus-driven norms of kindness and cooperation in favour of more disruptive, reflective, and transformative engagement.

## **4. Embracing Discomfort and Ambiguity**

Rather than avoiding conflict, design education should embrace emotional complexity, confusion and disruption. As some researchers argue, staying with discomfort can open new possibilities. Leberman and Martin (2002) identified two key factors for encouraging individuals to move beyond their comfort zones: reaching a state of flow by engaging with challenges that are balanced, that is, not too easy to cause boredom, nor too difficult to provoke anxiety, while experiencing a manageable level of risk that can foster personal growth. Working through tension, rather than resolving it too quickly, leads to a more layered, meaningful journey and outcomes.

## **5. Valuing Iteration and Failure as Emotional Processes**

Anger and frustration are part of the iterative design process. Encouraging students to accept and learn from emotional setbacks builds resilience. This mindset views failure not as a roadblock, but as an integral part of the design development process. These strategies call for a shift in design pedagogy: one that does not avoid difficult emotions but learns to work with them. In doing so, we can cultivate designers who are not only more emotionally attuned but also more socially engaged and empowered. When harnessed with care and clarity, anger becomes a force not of destruction but of transformation.

### 5.4.2 Recommendation Two: Implementing Anger as a Design Strategy

It is not straightforward to determine how to cultivate angrier designers. This research aims to collectively explore techniques that can be implemented to evoke the emotion of anger in the design students' process, thereby increasing their motivation and proactivity in the design process. Drawing from examples and discussions presented during the workshop, the following ideas have not yet been tested, but they serve as a starting point for engaging students in this important conversation. Therefore, this research aims not to provide conclusive tests or outcomes, but rather to open up possibilities. Testing and further investigation remain part of the future direction of this work, requiring continued exploration and thoughtful planning.

To evoke anger as a constructive force in design education, tutors can implement suggested techniques that treat emotion not as an obstacle but as a powerful driver of critical thinking and agency. The central recommendation is that when productively and deliberately activated, anger can become a source of student engagement, boundary-pushing, and a caring approach towards meaningful design achievement. This is achieved through pedagogical strategies that intentionally provoke emotional responses, foster emotional reflection, and provide the tools and space to channel that anger productively. Accordingly, the following points reflect the collective suggestions on how to evoke anger in students effectively:

#### **1. Provoking Anger through Rule-Making and Rule-Breaking**

One core technique involves introducing and disrupting systems of rules. Tutors can stimulate anger that highlights systemic injustices or design limitations by asking students to adopt, then deliberately challenge or break established design conventions. This confrontation pushes students to reflect on their values and worldviews while encouraging genuine responses. Projects framed around ethical constraints or social tensions, such as censorship, inequality, or power dynamics, enable students to explore personal and political grievances in a context that validates their emotions and demands reflective practice.

#### **2. Provoking Anger through Debates and Conflict Exploration**

Reflective journals, group discussions, and structured debates can help students verbalise their emotions, understand their origins, and translate them into meaningful design action. These spaces also teach emotional regulation, transforming what might otherwise be disruptive anger into a focused, generative energy. Facilitated dialogue and structured debate help students articulate anger, confront differences, and test ideas in a controlled but emotionally rich environment. These exchanges sharpen critical perspectives and reinforce the importance of listening and dissent in design practice. Rather than suppressing disagreement, these spaces nurture it, teaching students how to use anger to deepen understanding, refine arguments, and find common cause with others.

### **3. Provoking Anger through Social and Political Engagement**

Design education can also evoke anger by foregrounding social and political injustices, thereby aligning emotional responses with real-world advocacy. Projects focusing on activist causes, such as accessible public infrastructure or responses to international crises, connect personal emotion to collective resistance.

### **4. Provoking Anger through Embodied and Expressive Exploration**

Embodied tasks, such as freehand drawing, rapid model making, or aggressive mark-making, allow students to externalise anger physically, transforming abstract emotion into visual or material outcomes. These exercises prioritise process over product, enabling students to explore unexpected aesthetic forms and break out of restrictive perfectionism. Here, anger serves as a motivator and a medium of expression, providing access to a raw and authentic design process.

### **5. Provoking Anger through Reframing Design Briefs around Emotional Provocation**

Another key technique is reframing design challenges to emphasise emotionally charged issues, rather than neutral improvement. Instead of asking students to fix or enhance existing situations, tasks can invite them to tackle what makes them angry, turning personal irritation or dissatisfaction into a compelling problem statement. This emotional investment naturally drives deeper inquiry and heightens commitment to the design process.

These suggestions offer a way to enhance student engagement in the design process by fostering emotional involvement. When students are encouraged to confront and navigate their anger, they become more alert, motivated, and invested in their work. Far from being disruptive, anger can accelerate critical engagement, deepen self-awareness, and fuel design for meaningful change. The process becomes more dynamic and engaging by activating strong emotions, reducing emotional neutrality and encouraging deeper participation throughout the design journey. Prior research more specifically addresses the importance of anger in education. Compassionate anger in education helps students respond to injustice with moral awareness and a drive for change. Rather than suppressing emotion, it channels outrage into critical thinking and social action, making learning more ethical and engaged (Cho & Kim, 2022).

## 5.5 The Research Probes Value

This research introduces two cultural probes, the EmotionProbe and the Emotion Tracker, a verbal self-reporting tools specifically designed to capture the emotional experiences of design students during the design process. These probes aim to make students' emotions visible and accessible, offering both students and tutors insights into the emotional dynamics of the design process and projects. Significantly, this tool was developed to work cross-culturally, helping to explore emotional experiences among students from diverse educational and cultural backgrounds.

### 5.5.1 Usability

The usability of the probes was assessed through their practical application during two different projects. Observations revealed that the probes were easy to use, required minimal time to complete, and encouraged students to reflect meaningfully on their emotions within the design context. A consistent and engaging printed format was used to avoid digital tool distractions and ensure equal access for all students. The printed probes contributed to an engaging, tactile interaction with the tool, which aligned well with the hands-on nature of the design task. The probe structure allowed students to respond freely, supporting a sense of autonomy and inclusivity.

### 5.5.2 Reliability

In terms of reliability, the probe facilitated real-time emotional reporting without interference from researchers or tutors. This ensured that emotional data reflected students' genuine in-the-moment experiences. Because emotional experiences can shift quickly during design work, this immediate feedback feature is a key strength. Moreover, the probes enabled a multi-label analytical approach, offering insights into both individual and collective emotional patterns throughout the design process. Both provided valuable data not only for evaluating students' emotions but also for reflecting on how emotional fluctuations influenced their design decisions and engagement within the design process.

The probes provide support to tutors by offering an entry point into understanding the often-invisible emotional dimensions of students' design process. Emotions like relaxation, contentment, hope, anxiety, frustration, and boredom were tracked over time, enabling more informed pedagogical strategies. The ability to detect mixed emotions at a single stage of the design process, especially across cultures, demonstrates the tool's depth and sensitivity.

### 5.5.3 Strengths and Weaknesses

A major strength of the probes is the accessibility: both probes do not require advanced technical skills or expensive tools. They can be easily implemented in both physical and digital learning environments. The intuitive structure makes it suitable for regular use by students and tutors, enhancing self-awareness and emotional dialogue in educational

settings. Moreover, tracking and reporting emotions helped students develop greater self-awareness and a better understanding of their emotional patterns throughout the design process. It enabled them to identify the most challenging stages and explore ways to overcome these difficulties. It also supported their understanding of the factors that influenced their overall journey.

However, the study also identified various weaknesses in using a predefined list of emotions. While this structure helps streamline the tools, it may also restrict the full expression of emotional diversity. Some students expressed emotions not listed in the probes, such as excitement, stress, happiness, and others, pointing to the need for future iterations to include a broader emotional vocabulary or open-ended options. Recognising and addressing this constraint will enhance the probes' educational relevance. Students also mentioned experiencing mixed emotions that they couldn't fully express, as the probes only allowed them to select one emotion at a time.

Despite incorporating both intensity and repetition as part of the emotional probes, adding an important layer of information by highlighting both the overall emotional experiences and the capability to discover individual emotional journey also made the analysis more complex at certain levels. Therefore, it may be helpful to prioritise the tools based on the intended focus of the study. If the aim is to examine the overall emotional experiences throughout the design process, tracking the repetition of emotions proved to be more effective. However, measuring emotional intensity provides more meaningful insights if the focus is on understanding individual student experiences in depth. A notable weakness arises when intensity is used for one part of the analysis and repetition for another, as this inconsistency in measurement makes the analysis more difficult and complex. Another limitation was that some students struggled to identify or label their emotions, and the act of reflecting on their feelings sometimes increased their anxiety or stress.

## 5.6 Summary

This chapter has presented the main findings derived from the research studies. To achieve this, all the emotional experiences reported and tracked throughout the design process were compiled into a single comprehensive representation (see Figure 5-6, 5.2.2.3, p.327). This conclusive figure was informed by two key dimensions of the academic emotional experiences: activity emotions (see Figure 5-1, 5.2.1.1, p.314) and achievement emotions (see Figure 5-2, 5.2.1.2, p.316) in accordance with the design process (Milton & Rodgers, 2013). In addition, the reflections and explanations derived from the questionnaires and interviews were interpreted and further integrated into the analysis to create a coherent set of findings and to present a comprehensive view of the exploratory study approach. The resulting emotional journey pattern integrated the mentioned dimensions, serving as a navigational path through the extensive dataset. This synthesis enabled a deeper reflection on the gathered insights, facilitated the identification of relevant findings, and created the recommendations of this research.

The findings, organised around emotional valence and arousal dimensions, reveal a picture of students' emotional experiences throughout the design process. Students in both Jordanian and Scottish cohorts exhibited similar emotional patterns, reporting predominantly pleasant emotions and a relatively balanced distribution across activation and deactivation dimensions. In addition, the middle spectrum of emotions, which is often left uncategorised, highlights how students perceive and express neutral emotions during the design process.

In terms of activity emotions, despite intense frustration, students still described the overall design experience as pleasurable, indicating that negative emotions do not necessarily overshadow positive perceptions. Interestingly, although relaxation was positive, it often led to stagnation, with students lingering in comfortable early phases rather than progressing decisively. Anger was notably absent in most accounts; yet, when it did appear, it was often linked to care and investment, suggesting a suppressed or underdeveloped emotional vocabulary in design education. While in terms of achievement emotions, the studies highlighted the emergence of emotional detachment that it is referred as Emotionlessness State, which was more present in long-term projects, where early underestimation of time demands led to later-stage disengagement.

Concerning the design process stages, it is noteworthy that emotional engagement was highest during the early phases but declined in the later, more demanding stages. Additionally, the data indicate that student participation was most concentrated in the first two stages of the process, with the number of actively engaged students decreasing significantly as the project progressed. This suggests that not all students fully engage with every stage of the design process. Some tend to skip directly to the final stages, bypassing the crucial middle phases where exploration, experimentation, and trial-and-error occur, which are elements that are fundamental to a thorough and reflective design practice. This uneven distribution calls for greater emphasis on activating emotional engagement during

the middle phases of the design journey to promote sustained momentum and depth in students' work. Moreover, repetition and intensity patterns also revealed that frequently experienced emotions tended to be moderate in intensity, while more intense emotions were highly individualised. A sustained sense of contentment, paired with increasing neutrality, marked a gradual emotional shift toward disengagement. The appearance of emotional expressions using the word 'fine' further suggests a muted or low-intensity dissatisfaction among students.

These findings highlight the need for pedagogical responsiveness and strategies that maintain emotional engagement and support students' emotional resilience over time. By acknowledging anger as an early signal of dissatisfaction and goal obstruction, tutors can help students harness anger to navigate feedback and challenges constructively.

Anger has the potential to serve as a powerful counter-force to emotional stagnation, indecision, and disengagement. Anger can be a powerful emotional resource in design education when harnessed correctly. Anger serves as an emotional activator, helping to re-engage students during passive or neutral phases by encouraging them to confront sources of frustration, such as social injustices or system inefficiencies, as design opportunities. When students struggle with decision-making, anger can highlight what truly matters to them, guiding value-driven choices. Validating anger through reflective practices like journaling or critiques helps students build emotional resilience and use frustration as a catalyst for iteration and experimentation. Framing anger as a moral and creative response supports the broader educational goals of fostering criticality and social responsibility. Practical strategies include designing provocative workshops, integrating emotion-focused critique sessions, developing anger-specific reflection prompts, and encouraging emotional mapping to normalise friction as a vital part of the creative process.

Overall, the presence of overly positive emotions during the design process had a noticeable impact on students' progression. It increased their hesitation to move forward, reduced their ability to confront challenges at various stages, and delayed their transition to subsequent phases. As a result, they tended to invest less effort and time in the crucial middle stages of the process. These emotions often led students into a loop of decision paralysis, ultimately hindering their design development.

By promoting anger as a legitimate and productive emotion, design tutors can help students move beyond emotional inaction, navigate ambiguity with greater agency, and engage in critical, purpose-driven design work. This research concurs with Lindebaum and Gabriel (2016) when they say "*A world without anger would be a compliant and acquiescent world relying, by necessity, on behavioural prescriptions seeking to choke up anger and restrict its expressions, demanding that people be 'nice' and 'radiant' with positivity*" (Lindebaum & Gabriel, 2016, p. 905).

This perspective calls for a cultural shift in how emotions, particularly anger, are understood and supported within educational settings, transforming them from a taboo into a tool for empowerment and change.

The next chapter will provide answers about design students' emotional experiences during the design process, as introduced at the beginning of this research. It will also reflect on the research aims and the extent to which they have been achieved. Ultimately, the chapter will address the central research question that inspired this research:

### **Is Design Delightful?**

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*This chapter provides a reflective conclusion on how the research met its aims, objectives, and guiding questions. It highlights the study's key contributions to knowledge, particularly in understanding the emotional dimensions during students' design journey, and outlines the broader academic and practical impact of the findings. The chapter also acknowledges the study's limitations and offers recommendations for future research, encouraging further exploration of emotion-informed approaches in design education.*



## 6.1 Introduction

This final chapter draws together the core insights and contributions of the research, offering a reflective overview of what has been learned about the emotional experiences of design students throughout their design journey. The chapter serves as both a synthesis and a forward-looking dialogue, positioning emotion not as a secondary aspect of design education but as a central and formative element.

The chapter begins by revisiting the research aims and outlining how they have been achieved. These include identifying the range of emotional experiences students undergo while designing, mapping emotional patterns and networks that emerge across different phases of the design process, and examining how these emotional experiences influence students' approaches and reflective practices.

Then the chapter provides an answer to the main research question of this research. Noting that the answers exceed the fact whether students' design journey is pleasurable or otherwise, these answers also include the complexity of navigating emotions that are often difficult to present by considering the role of emotional experiences in design. This opens up a discussion around how design education might better accommodate and engage with the full spectrum of design students' emotional experiences.

Then the chapter highlights the key contributions this research makes to knowledge and practice. This includes the creation of two design research tools, the EmotionProbe and the Emotion Tracker, that enable a deeper understanding of students' emotional landscapes. It also presents a new perspective of emotional experience patterns in design, revealing links between emotions and the emergence of novel emotional phenomena in the design process.

Building on this, the chapter argues for rethinking the presence of emotions within design education. Rather than treating emotion as a private or incidental experience, the research advocates for a more deliberate integration of emotional discourse into design pedagogy. Specifically, proposing anger as a productive emotional force that can be channelled as a strategic design tool that encourages critical questioning, agency, and transformation.

The chapter concludes with reflections on the wider impact of the research, the limitations encountered, and possibilities for future work. The research hints toward new directions for designing emotional frameworks, educational tools, and pedagogical practices that can fully support students as emotional, reflective, and imaginative agents in their learning and design journey.

## 6.2 Achieving the Research Aims

This study's main aim is to reveal design students' emotional experiences during the design process and examine how these emotions, in turn, influence and shape their decision-making and design journey. Figure 6-1 illustrates the relationship between the research aims, the questions formulated to achieve these aims, and the research methods employed to answer these questions, ultimately contributing to the fulfilment of the research aims.

|                    | AIM ONE   | AIM TWO   | AIM THREE   |
|--------------------|---|---|---|
| RESEARCH AIMS      | TO IDENTIFY THE EMOTIONAL EXPERIENCES OF DESIGN STUDENTS DURING THEIR DESIGN PROCESS  | TO IDENTIFY THE PATTERNS IN STUDENTS' DESIGN JOURNEYS   | TO IDENTIFY THE IMPACT OF THE EMOTIONAL EXPERIENCES ON STUDENTS' DESIGN PROCESS   |
| RESEARCH QUESTIONS | <p>RQ1.1. RQ1.1. What range of emotions do design students identify when designing?</p> <p>RQ1.2. How do different emotions manifest in the students' design process?</p> <p>RQ1.3. Are the students' emotional experiences pleasurable or otherwise?</p> <p>RQ1.4. What are the dominant emotions experienced by design students?</p> <p>RQ1.5. What significant emotional phenomena can be found in the design process?</p> <p>RQ1.6. What is the meaning of emotions from the design students' perspectives?</p> | <p>RQ1.2. How do different emotions manifest in the students' design process?</p> <p>RQ1.5. What significant emotional phenomena can be found in the design process?</p> <p>RQ2.1. What are the relationships between students' emotions and their design process stages?</p> <p>RQ2.2. How are emotions and design process stages distributed throughout the design process?</p> | <p>RQ2.3. What are the factors impacting students' design process?</p> <p>RQ3.1. What is the usability and reliability of emotion tracking tools during the design process?</p> <p>RQ3.2. How can we promote the employment of emotion in design education?</p> <p>RQ3.3. What strategies can be employed to incorporate emotion in the design process?</p> <p>RQ3.4. How can design tutors create a space for students to explore their emotions productively?</p> |
| RESEARCH TOOLS     | EmotionProbe<br>Emotion Tracker<br>Feedback Sheet<br>Interview  | EmotionProbe<br>Emotion Tracker<br>Interview  | Feedback Sheet<br>Interview<br>The Angry Design Workshop  |

Figure 6-1. Research Aims, Questions, and Tools Connections.

To find answers to the main research question, this research investigates these research aims and their associated objectives. In the following section of this chapter, each research aim will be achieved by providing the answers obtained from the research questions. Where appropriate, the data and information derived from the preliminary, main, and verification studies will be used. A summary will be presented by reassessing the results of all the studies.

### *6.2.1 Research Aim One: Identify the Emotional Experiences of Design Students during their Design Process*

The first research aim was to explore the emotional experiences of design students, focusing on establishing a base understanding. This included discovering important elements including the range of emotions experienced, how these emotions are expressed, the dominant emotions, and the meanings students assign to these emotions. The following subsections describe and explain these elements in detail.

#### *6.2.1.1 Design Process Emotion Ranges*

The emotional range reported by students revealed a broad and diverse spectrum of emotions experienced throughout the design process. This spectrum encompassed both commonly shared emotions across students and more individual, context-specific emotions. Students contributed a rich variety of emotional descriptors in both studies, suggesting that while the design process evokes a wide emotional landscape, certain specific emotions are more closely tied to the experience of the design journey. Among the most widely shared emotions, relaxation, hopefulness, contentment, and enjoyment emerged as the most prominent positive emotions. These emotions appeared consistently across student accounts and were often linked to moments of the design flow, achievement, and activity in the design process. In contrast, anxiety, frustration, and boredom were the most apparent negative emotions, typically associated with time pressure, uncertainty about project direction, or design blocks.

In addition to these dominant emotions, students also referred to other relevant feelings, such as excitement, which presents a pure emotion that doesn't belong to a defined goal or objective (Husband, 1935). Jealousy is considered a positive force within the Greek culture and is closely linked to ambition and the pursuit of excellence. Artistic jealousy, in particular, goes beyond personal feelings and operates within ideas, where new concepts compete for recognition and validation (Nelson, 2009). In the design context, jealousy holds strong associations and is not entirely negative, as it is often tied to notions of honour, pride, and glory (Rodgers & Bremner, 2021). Students also mention being bored, which is characterised as an unpleasant emotion marked by a lack of stimulation and low physiological arousal. Boredom also includes symptoms such as prolonged perceptions of time, disengagement tendencies, and reduced motivation to engage in activities (Pekrun et al., 2010). In addition to satisfaction and 'fine' occupying a neutral experience. These mentions suggest that the emotional range is not limited, but students gravitate toward specific emotional clusters depending on their experiences and the progress of the design process.

#### *6.2.1.2 The Design Process Emotion Manifestation*

An overarching manifestation emerges as follows: while students predominantly experience pleasant emotions during the design process, these emotions are not evenly distributed across all phases. The early stages are marked by higher levels of positive emotions, which correlate with increased student engagement and time investment. In

contrast, the later phases of the process see a rise in unpleasant emotions, which corresponds with a visible decline in both emotional vibrancy and student involvement within the design process. Crucially, the middle stages involving concept development and detailed design reveal a notable emotional neutrality. These phases exhibit fewer emotionally charged responses, indicating a shift in emotional engagement. This neutrality, however, should not be mistaken for ease or simplicity; rather, it signals a potential area of emotional stagnation, where students may lack the affective motivation needed to maintain momentum and take a directional decision-making approach to the design process, progress and focus.

The uneven distribution of student engagement mirrors the inconsistency in the emotional tone across the process. Process stage engagement is at its highest during the initial stages, then declines as the process advances, particularly in the emotionally neutral middle stages. This suggests that students tend to remain in the comforting early phases while avoiding the more emotionally demanding stages.

### *6.2.1.3 Design Process Emotion Significances*

Significantly, a shared emotional experience across diverse student groups was approved. Regardless of cultural background, project type, or period, students reported similar experiences of emotional highs and lows. This indicates that certain emotional responses, particularly those linked to design activity and achievement, are consistent elements of the design process experiences. The design process was overwhelmingly described as a pleasant emotional journey. Students frequently associated the process with positive emotional experiences marked by pleasurable activation of emotional experiences. Yet, Scottish and Jordanian students had notable cultural differences in their emotional responses. Scottish students appeared more open in discussing shame and pride, whereas Jordanian students rarely mentioned these emotions. This aligns with broader cultural patterns of emotional expression (Hu, 2022) and suggests that emotional openness in the design process is influenced by sociocultural context.

Students also shared detailed interpretations of specific emotional terms. The word 'fine' was widely recognised as emotionally ambiguous; used when students felt neutral, disengaged, or bored. This sentiment was echoed in English and Arabic, where equivalent terms were used to avoid vulnerability or deeper emotional reflection. In contrast, contentment was described as a calm, grounded emotion, reflecting the sense of satisfaction typically arising after task completion or steady progress. Students viewed contentment as a positive neutral, while 'fine' was a negative neutral. This space is marked by the emotional neutrality label, acceptance, with enough, rather than pursuing more engagement and investment in the design project. Moreover, a new emotional state emerged: emotionlessness, a state represent detachment in which students described feeling disconnected, unmotivated, or indifferent toward their design process or project. This was often reported during the middle stages, repetitive, associated boredom, or being satisfied at a certain point. Students across

both groups linked this state to a lack of emotional engagement, passion, and energy, and a noticeable lack of care or connection to their project.

Most significantly, the research revealed a near-complete absence of anger in students' emotional narratives. Across all studies, anger was either not mentioned or actively dismissed as irrelevant to the design process. This absence is critical, highlighting a potentially unexplored emotional space in design education. This insight suggests promising directions for future research into how anger might be acknowledged, understood, and constructively integrated as a motivational or reflective tool in the design process.

## *6.2.2 Research Aim Two: Identify Patterns in Students' Design Journey*

After exploring the first aim, the second aim of this research focuses on establishing a better understanding of students' design process patterns in terms of emotional distribution and stage distribution. This aim centres on building connections and mapping students' experiences within current design education practices. Specifically, to identify and describe recurring emotional patterns throughout the design process by linking emotions and mapping their interrelations. Moreover, the second aim seeks to pinpoint emotionally phenomena moments and the challenging stages within the design process.

### *6.2.2.1 Design Process Patterns*

According to this study, the design process was not linear, but also marked by imbalanced emotional patterns across the different stages. These emotional patterns mark the different phases in the design journey. Emotions were not experienced randomly; rather, they followed a patterned progression, mapping onto the evolving demands on students. In turn, the emotion labelling provides an additional layer of insight, highlighting which stages of the design process are most enjoyable and which are the most challenging. Emotion labelling is essential for articulating feelings, as it conveys not only how one feels but also the context and implications of those emotions and helps in sharing perspectives and understanding interpersonal dynamics (Hoemann, 2024).

The design process begins with the brief and research stages, where students most often experience positive emotions such as enjoyment and relaxation. These early stages are exploratory, open-ended, and allow for imaginative thinking, which fosters feelings of freedom, curiosity, and optimism. The tasks here, which include understanding the context, identifying problems, and gathering insights, tend to be less pressurised and more generative, encouraging a sense of ease, comfort, and engagement. As the process moves into the middle stages, including concept design, design development, and the beginning of detailed design, the emotional tone shifts toward neutral emotions, such as contentment, hopefulness, and sometimes boredom. This emotional middle ground reflects a phase where ideas begin solidifying, and decisions must be made with increasing structure. While contentment and

hopefulness suggest a comfortable aspect and position in the design process, the emergence of boredom implies that repetitive or uncertain tasks may reduce excitement. These neutral emotions indicate a transitional zone, where emotional energy may fluctuate depending on progress and clarity. Finally, in the end stage, especially during focused, detailed design and production, there is a clear rise in negative emotions like anxiety and frustration. These emotions are linked to the stress of deadlines, technical constraints, and the need to finalise and deliver outcomes. The focus becomes narrower, the pressure increases, and design possibilities reduce, often leading to emotional strain. These emotions are not just reactions to workload but are also tied to increased personal investment and the fear of falling short.

Correspondingly, a parallel pattern between the felt emotion and the design process stage emerges: positive emotions dominate in the early (initial) stages, where the process is expansive and open to possibility. Neutral emotions appear in the middle stages, reflecting the transition from exploration to a harder stage of transitions and deciding a direction. Negative emotions emerge more strongly in the final stages, where intensity, pressure, and constraints peak. This alignment shows that emotional experiences are not scattered, but reflects students' design journey's demands. Each emotional phase corresponds with the nature of the design stage characteristic: generative and playful early on, evaluative and decision-heavy in the middle, and critical and outcome-driven at the end. As a result, students stated that the research stage was one of the most enjoyable stages of the process, largely due to the excitement of exploring new opportunities and making discoveries. In contrast, the production stage was seen as the most challenging, as it involved the pressure and stress of bringing ideas to life and the validation that can lead to success or failure.

Recognising such patterned progression is important in design education, as it suggests that emotions are deeply tied to the decision-making and problem-solving students will do at each stage. These patterns also provide an opportunity to plan targeted support and reflection practices that acknowledge these shifting emotional landscapes.

#### *6.2.2.2 Design Process Emotional Networks*

This study offers a deeper understanding of how students experience, interpret, and connect various emotions throughout a real-time design project. The research highlights how emotional responses are not isolated or static, but instead form new networks of interrelations shaped by students' engagement with their design project and the reflective moments they encounter during the design process.

Through students' own perspectives, the research reveals that emotional dynamics within the design process function as an interconnected network that shifts over time. Central to this design process, the emotional network is the frequently reported states of contentment and 'fine', which consistently emerged across all data collection methods. Though seemingly neutral in tone, these emotions held significant weight in how students made sense of their design experiences. Contentment was often described as a calm, steady feeling associated

with satisfaction. In contrast, 'fine' carried more ambiguous connotations, often signalling an emotional boredom-related routine. These two emotions form the emotional baseline of the design process, where students appear emotionally steady but are, in reality, shifting between subtle variations in attention, energy, and motivation. The neutrality they represent is layered and complex, not empty of feeling, but filled with quiet signals of change that can indicate the starting point of decline in design engagement.

Around this core cluster, satisfaction and boredom appeared sporadically, yet indicated the moments of beginning to lose engagement and shifting into a neutral position. Their presence often marked the early stages of emotional shifts where students began moving away from active engagement and into more passive or uncertain emotional positions. These emotions were often not consciously acknowledged during the design projects but surfaced throughout the processes, revealing their hidden influence on the students' decision to progress and actions.

What links these emotions is their ambiguity and difficulty in classifying within traditional emotional frameworks. They do not fall neatly into positive or negative categories, and instead occupy a middle space where an emotional grey zone exists, where feelings are neither fully pleasant nor entirely unpleasant. This ambiguity is key to understanding how students emotionally navigate the design process: their emotions are not always dramatic or clearly defined, but often subtle, mixed, and deeply tied to the rhythms of their design activity. Recognising this emotional middle ground is crucial to appreciating the full emotional spectrum of design learning.

### *6.2.2.3 The New Design Process Emotional Phenomena*

Prior to this research, emotional dimensions in the design process were commonly understood through the lens of well-established psychological frameworks, primarily focusing on valence (positive to negative) and arousal (high to low activation). However, this study introduces a previously underexplored emotional dimension: emotional neutrality.

The research uncovers a unique emotional experiences among design students, revealing a pattern that extends beyond the conventional understanding of emotions, such as satisfaction or boredom. Specifically, the study maps how emotions such as satisfaction and boredom may evolve into contentment and 'fine', respectively, both of which eventually converge into a new emotional state termed Emotionlessness State.

Emotionlessness emerges as a important indicator of emotional disengagement from the design process. It is closely tied to a loss of passion, care, and motivational drive, and represents a significant psychological shift. This state does not simply denote the absence of emotion, but rather a numbness that results from an accumulation of either overly positive neutrality (e.g., passive contentment) or negative neutrality (e.g., passive boredom). It signals that students have stopped investing in their design journey.

An important distinction is made between emotionlessness and the broader concept of the Design Neutral Schema. While emotionlessness is a result, an endpoint where emotional input and output are essentially flatlined, the Design Neutral Schema is the gradual emotional process that leads toward this outcome. This process illustrates how students can shift from active engagement to passive detachment, which often happens unconsciously.

### *6.2.3 Research Aim Three: Identify the Impact of the Emotional Experiences on Students' Design Process.*

After exploring, identifying, and developing a solid understanding of the design students' emotional experiences, the third aim focuses on exploring how the knowledge obtained could be applied to create a meaningful impact on both students and, more broadly, the design education landscape. Hoemann (2024) emphasised that the context in which emotion words are used is crucial, as it shapes their influence on emotional functioning. As a result, the first step was to identify the factors influencing students' emotions in order to understand how these factors affect students' engagement in the design process.

By defining how these factors are reflected in students' emotional and design experiences, the research third aims to propose ways of intentionally integrating emotional awareness into the design process. This approach seeks to enhance future learning experiences by creating more balanced and reflective design practices. Given the increasing complexity of challenges students may face in the future, the research highlights the need for a more elaborated and emotionally attentive approach to design. The study aims to foster more balanced and reflective design experiences through the lens of emotion.

#### *6.2.3.1 Factors Impacting Students' Emotional Experiences*

The emotional experiences of design students were shaped by a dynamic interplay of external and internal factors, with social pressures standing out as the most influential external trigger. These included challenges related to peer comparison, communication with supervisors, and family and social dynamics, which profoundly impacted students' emotions. In addition, environmental conditions such as study space quality and seasonal mood shifts, along with technological challenges like adapting to new tools and economic concerns about living costs and part-time work, also contributed significantly. Political and cultural contexts played a more minor but still relevant role, as did wellness-related concerns tied to mental and physical health. On the internal side, students' management and research skills had the most pronounced emotional effects, both positively, through improved confidence and productivity, and negatively, through stress, procrastination, and emotional disengagement. Thinking, communication, and emotional regulation skills also played key roles, with students experiencing emotional highs when skills were effectively applied, and lows when they faced creative blocks, communication breakdowns, or emotional overload.

The design process was an emotionally rich journey, with critical moments such as supervisor interactions, concept development, user engagement, and jury presentations shaping students' emotional landscapes. Positive reinforcement and milestone achievements fostered growth and motivation. At the same time, personal struggles and peer comparisons often led to stress and self-doubt, yet in some cases, they play a significant role in motivating students to push and do better.

However, to manage external influences, students adopted certain strategies such as treating university like a job, maintaining work-life balance, and seeking supportive social environments to stay motivated. Many emphasised the importance of time management and planning ahead as key tools for dealing with uncertainty and delays. When external disruptions were unavoidable, students either adapted their workflow by moving on to other tasks or took a step back to reset emotionally before continuing. Interestingly, students seized the opportunity and used emotion tracking as a self-awareness technique that included their emotional reflection, validation from peers, and mindfulness practice tools. Some focused on their end goals or broke tasks into manageable parts to maintain momentum. Others sought emotional support from friends or used creative outlets, nature, and spirituality to stay grounded. Importantly, many students emphasised the value of emotional regulation, recognising when emotions were affecting their productivity and finding ways to reframe or release them.

Moreover, students' emotional responses varied across different design projects, and the definition and clarity of the project topic shaped these experiences. Moreover, project duration and management led to variations in emotional experiences and influenced decision-making during the process. Ultimately, the students' emotional experiences reveal that design education is not only cognitively and technically demanding but also deeply emotional, requiring clear support systems and strategies to help students navigate both internal and external challenges.

#### *6.2.3.2 Emotion Impact on Students' Design Process*

Students' emotions are influenced by the various factors mentioned, and in turn, these emotions affect students' design experiences. When students are attuned to their emotions during the design process, the analysis showed that their decision-making is also shaped by these emotional influences, particularly in how they manage information, communicate, plan, and solve problems.

Students realise that their emotions play a central, though often overlooked, role in shaping their design process, in which these emotional experiences influence the outcomes and progress of their design process. When students respond to their external factors (e.g., people, situations, challenges), those responses show up as emotional and affective states (Scherer, 1984) that students process internally (Ho, 2024) and influence the decisions they make (Ho & Siu, 2012). Accordingly, this realisation is provided through the act of tracking and reflecting on the emotional experiences. Many students became better aware of how

specific emotions, such as anxiety, frustration, or satisfaction, correlated with particular stages of their process, and when they emotionally react to things around them, those inner emotions shape how they think and what decisions they make during the design process. Students' processing of information and efforts to understand external factors, such as the use of new technologies, influence their emotions and lead to different forms of decision-making (Cupchik, 2004; McDonagh et al., 2004). Furthermore, some students reported that when faced with internal challenges during the design process, they decided to avoid or escape the situation rather than confront their emotions at that moment.

Therefore, emotional awareness not only important to deepen students' understanding of their own working patterns but also to allow them to make practical adjustments in how they planned and approached their progress. For some, identifying emotional triggers (e.g., stress during manufacturing or uncertainty in early ideation) led to more thoughtful time management and a shift in expectations. Others found that simply naming their emotions created space for emotional regulation, allowing them to work more calmly and effectively.

Students who previously ignored or suppressed negative emotions came to understand that these emotions had been silently influencing their decisions and mental wellbeing. In contrast, tracking emotions made these patterns visible, giving students greater agency over their responses. Moreover, the emotional reflection process provided students with a sense of validation and self-compassion. Many recognised that unproductive weeks were not failures but natural outcomes of emotional strain, especially when external pressures were high. This shift in perspective encouraged a healthier and more resilient approach to design.

In sum, emotions were not passive background experiences in students' design journey; they were active forces that shaped motivation, decision-making, and outcomes. When made visible and reflected upon, emotions became tools for growth by enabling students to navigate complexity with greater self-awareness and intentionality.

### *6.2.3.3 Reflective Design Experiences through the Lens of Emotion*

After recognising the relationship between students' emotions, design process, decision-making, and identifying a recurring pattern of student disengagement, research aim three focuses on integrating emotional awareness into the design process to enhance future design learning experiences, using emotion as a driving force to motivate students and foster deeper engagement.

Using emotion as the lens during the design process, students place significant value on emotional support throughout the design process. Students emphasised the importance of supervisors who can recognise and respond to the emotional dimensions of their work, offering encouragement and a space for open dialogue. Constructive feedback that balances critique with positive reinforcement was seen as especially important for maintaining motivation and confidence. Clear communication, structured meetings, and regular checking,

both academic and emotional, emerged as key factors in helping students manage stress and navigate complex project stages. Additionally, students expressed appreciation for supervisors who showed emotional intelligence and adaptability, especially during periods of doubt or disengagement. Practices such as informal conversations, outdoor meetings, and reassurance through personal connection further contributed to a sense of emotional safety and belonging. These insights suggest that integrating emotional awareness into design education practices is not only beneficial for student well-being but can also enhance engagement, resilience, and the overall learning experience in design education.

Most importantly, this research uncovers a critical insight into the emotional dynamics experienced by design students: overwhelmingly positive emotions do not necessarily correlate with optimal learning or creative outcomes. In fact, the findings suggest that students report consistently positive experiences and feelings, but often find themselves emotionally disengaged. This disengagement is described as the Design Total Neutral Schema, points to a disconnection from the deeper affective and critical processes essential for meaningful design engagement.

Moreover excitement emerged frequently in the emotional spectrum of students, its function appears limited in catalysing action or deeper reflection. As Stratton (1928) explained, excitement lacks the clear directional impulse that defines other emotions, such as anger. Excitement is characterised by a broad, undifferentiated arousal emotion that does not necessarily translate into focused or critical design output. Moreover, excitement, as Stratton argues, may represent an earlier or more primitive form of emotional experience, lively but non-directive. Further, students frequently reported experiences of frustration often a result of unmanaged stress and pressure. As Ashari et al. (2024) observe, when stress remains unmanaged, it tends to reduce both cognitive clarity and productivity, leaving students feeling stuck or defeated. All these emotions, the fluctuations students went through, and the imbalance and the difficulty to create a motivation, directed the research to benefit from the power of certain emotions and use it as a tool. One of the reasons that made this research direction to anger was due to anger almost absence, even though it is an important basic emotion.

Concerning other emotions, when comparing excitement to anger, anger evokes curiosity and play as a strong signal for change and action (Johnson & Connelly, 2014). In addition, anger, particularly when examined through the lens of its relationship to frustration, reveals a more nuanced and potentially productive role in design education. However, frustration, if recognised and redirected, can evolve into agentic anger, a more assertive and action-oriented emotion. Marcus (1978) describes anger as a voice for unspoken frustrations, especially valuable in settings where emotional expression is typically discouraged. In the context of design education, where critique, failure, and iteration are inherent to the process, allowing space for anger can validate students' emotional struggles and offer them a way to channel that energy constructively.

This research proposes the deliberate inclusion of anger as a motivational force to counteract the emotional disengagement found in persistently positive or neutral experiences. Anger's strong impulse and defined action orientation make it particularly effective in disrupting complacency and pushing students toward resolution, critical thinking, and deeper design inquiry. By acknowledging and legitimising anger as part of the emotional spectrum, design education can offer students a more balanced emotional experience, one that not only embraces excitement but also leverages discomfort and agitation as catalysts for growth. In conclusion, rather than viewing anger as a disruptive or undesirable presence, this research suggests repositioning it as a productive emotional tool. When guided and contextualised, anger has the potential to activate reflection, enhance student engagement, and enrich the overall design learning journey.

## 6.3 Is Design Delightful?

Based on the responses to the research questions, which collectively address the overall research aims and related objectives, it is now possible to answer the main research question: **Is Design Delightful?**

The answer is both yes and no; there is no single definitive response to this question. Whether design is experienced as delightful depends heavily on the designers' journey and the emotional landscape of their design process. Although in my 14 years of experience, design has always been a source of delight, contrasting opinions suggest otherwise. Some perspectives view design as harmful, producing impacts that are far from delightful (Papanek, 1971). Scholars have highlighted that the harms of design can manifest in various and sometimes serious forms (Riddell, 2023), while others explore the fact that design can kill and exclude (Shariat & Saucier, 2017).

Yet, this research shows that design is not inherently delightful when the process is overly positive. An emotional imbalance, especially one skewed toward persistent positivity, can diminish motivation and effort, keeping students in their comfort zone, without pushing or trying to change the situation. When designers experience excessive enjoyment and relaxation early on, it can lead to procrastination and distraction from confronting the transition between stages. This comfort may create a false sense of security, delaying important progress during the design process. As deadlines draw closer, anxiety and frustration emerge, disrupting the design flow. These fluctuations can cause emotional detachment, where the designer becomes disconnected and overwhelmed rather than engaged.

However, design can become delightful as well when the emotional experiences are balanced and thoughtfully integrated throughout the process. Emotions often perceived as negative, such as anger, or jealousy can be reframed and used constructively. Instead of being avoided, they can be harnessed to fuel students' ambition, motivation, and purpose to create a more energetic design experiences (Lindebaum & Gabriel, 2016; Lindebaum & Geddes, 2016; Lindebaum et al., 2017). For example, jealousy has been shown to push designers to improve and take bold steps (Nelson, 2009). Similarly, this research highlights how integrating anger early in the design process can help students remain engaged and driven. Introducing emotional challenges and discomfort, when done intentionally, prevents disengagement and encourages deeper reflection and investment. Constructive anger can act as a catalyst, pushing designers out of their comfort zones and leading to a more fulfilling, meaningful, and ultimately delightful design experience.

### 6.3.1 Summary

Emotion plays a fundamental and multifaceted role in the design process, particularly for design students, as it significantly influences how they manage their design process and projects, make decisions, and solve problems. Despite emotions importance, design students often lack a clear understanding of how their emotions affect their design process, thinking, and outcomes. Emotional and affective states act as deep-rooted factors in decision-making, a core component of the design process. For students who are still developing their design expertise, emotions can guide judgments, especially in ambiguous situations where there are no clear right or wrong answers. Moreover, emotions help manage cognitive load by allowing students to make quicker distinctions between options, which is especially helpful when navigating complex or unfamiliar design challenges. Emotions also influence how students interpret and process information, enabling more effective differentiation between useful and irrelevant details. Emotion supports divergent thinking, which is essential for creativity and innovation, and can expand students' cognitive flexibility when tackling open-ended tasks.

Beyond individual decisions, emotion also impacts how students manage the entire design process. It can function as both a motivator and a regulatory tool, helping students reflect on their actions, evaluate their progress, and make adjustments as needed. Many students report emotional highs and lows during their design journey, without receiving instruction on how to use these emotional cues constructively. This lack of emotional awareness and training often contributes to students feeling overwhelmed, disengaged, or stuck during different stages of their projects. In addition, emotional responses are deeply tied to students' motivation, behaviour, and academic performance. While some negative emotions such as anxiety may hinder performance, others like jealousy and anger can serve as productive triggers for critical thinking or increased effort. Likewise, positive emotions such as enjoyment and excitement are closely linked to academic success and creative confidence. Emotion also plays a role in shaping a student's personal design style, as preferences and emotional attachments to techniques or aesthetics often inform their design choices and problem-solving paths. Yet, emotions are not isolated from context; they are shaped by internal and external factors such as cultural background, social norms, economic constraints, and technological tools. Students' emotional responses to these factors influence the decisions they make and, ultimately, the design outcomes they produce.

The research has revealed that, within the context of design students' design processes the emotional experiences are shaped by a combination of the following elements:

- **The Design Project:** Emotional engagement was strongly influenced by whether students received a predefined brief or created the brief themselves. When students authored their own briefs, they demonstrated greater project ownership, leading to deeper emotional involvement and more focused emotional responses. In contrast, when working on tutor-defined projects, students tended to follow instructions more passively, resulting in less emotional engagement within the design process.

- **Design Process Timeline:** The duration of a project significantly affected students' emotional journey. Longer timelines allowed for the emergence of new phenomena and more reflective transitions between stages of the design process. Conversely, shorter timelines often led to quicker transitions driven by deadlines, which limited emotional disengagement but also constrained the depth of emotional exploration.
- **Internal and External Factors:** Various personal and contextual factors played a role in shaping students' emotional experiences throughout the design process. These factors were integral to how students navigated and emotionally responded to their projects.
- **Cultural Perspective:** Cultural background influenced how students interpreted and expressed emotions. This understanding of emotional expression through a cultural lens added another layer to how emotions were experienced and communicated during the design process toward specific emotions such as shame and pride. This approach will be explored further in future work.

The research highlights several key insights regarding the emotional experiences of design students throughout their design processes. These experiences were found to be predominantly overtly positive, often characterised by a balanced activating force. While this emotional positivity can enhance students' engagement, motivation, and progress, leading to a deeper involvement, and a stronger sense of ownership, it also carries potential drawbacks. Being overly positive proved to obscure critical reflection, reduce students' ability to recognise challenges, and mask underlying frustrations or uncertainties. In some cases, persistent positivity can discourage honest self-assessment or lead to emotional burnout when expectations are unmet. Therefore, although positive emotions play an important role, a more nuanced emotional awareness, one that embraces both dimensions of the emotional experiences, is essential for a deeper, more resilient engagement with the design process.

At the same time, neutral emotions also emerged as a consistent component of the design experience. These experiences were often associated with moments of stagnation, reduced motivation, or task-oriented engagement, where emotional connections were diminished. Rather than being entirely negative or positive, this neutrality indicated periods where students were not emotionally invested in the design process, often appearing in the middle stages of the design process. These moments highlighted the fluctuating nature of emotional engagement, revealing how students shift between emotionally charged and neutral experiences depending on the project phase, level of autonomy, or various factors including external pressures such as deadlines.

Importantly, the research found that students, despite their diverse cultural and personal backgrounds, shared remarkably similar emotional patterns across their design journey. This commonality suggests that certain emotional responses may be inherently tied to the nature of the design process itself, rather than being solely shaped by individual context. For instance, feelings of frustration often arose during blocks or prototype failures, while excitement and contentment were commonly reported during phases of exploration flow, steady progress, or successful iterations.

Many students also expressed a strong interest in developing a better understanding of their emotional landscapes. They recognised that their emotional responses, especially those that operate at an unconscious level, had a significant influence on their thinking, decision-making, and design output. By becoming more emotionally aware, students began to identify recurring emotional patterns and how these aligned with or disrupted their progress.

Moreover, the research observed that imbalances were present not only in emotional intensity but also in how activities were distributed across the stages of the design process. Some students experienced prolonged emotional highs or lows tied to specific phases, while others shifted rapidly between emotions due to unclear structure or pressure points in the project timeline. These emotional and procedural imbalances point to the need for better emotional regulation and reflective practices within design education. Supporting students in recognising, managing, and learning from their emotional experiences may be key to fostering a more consistent, resilient, and enriching design journey.

Despite this wide ranging impact, the role of emotion in the design process is often overlooked in formal education. Students may understand that emotions affect their daily lives, but struggle to connect this awareness to their design practice. This gap points to a deficiency in current design curricula, which rarely address emotional literacy or provide tools for emotional understanding or awareness. Integrating emotion into design education is essential, not only to help students better understand and manage their own processes, but also to improve their understanding about themselves and enhance their decision-making, aiming to produce higher quality, meaningful design outcomes.

## 6.4 Contribution to New Knowledge and Understanding

This doctoral research has identified noticeable gap of exploratory studies that examine design students emotions experienced in the design process during their design journey. The research began by reviewing literature on the design process and emotions, emphasising the importance of integrating these fields within design education. The aim was to raise awareness and foster understanding that can benefit both design students and design tutors. By identifying this gap, the research established a clear direction and has generated new insights and contributions to the design research field. The research presents a substantial contribution to new knowledge and understanding they can be summarised as presented in Figure 6-2 and are discussed on the following subsections.



Figure 6-2. Research Main Contributions.

### *6.4.1 First Contribution: Two New Design Research Tools for Exploring Design Students' Emotional Experiences during the Design Process*

The EmotionProbe and the Emotion Tracker, presented in the methodology chapter, along with the emotional data gathered from students through these tools, constitute original instruments specifically designed to observe and explore students' design processes and the emotions experienced within a design education context. Both tools offer a valuable approach to data collection and analysis, revealing significant insights and simultaneously acting as reflective resources for the students using them. Each tool was specifically developed to establish links between different stages of the design process and the emotions associated with those stages.

#### *6.4.1.1 The EmotionProbe*

More precisely, the EmotionProbe proved to be user-friendly, easy to navigate, quick to complete, and cost-effective to produce. The EmotionProbe takes the form of a printed booklet consisting of 60 pages. The use of large typography prompts, a graphical scaling system, and an emotion wheel, displayed on the extended left section of the booklet, makes navigation intuitive and focused, despite the length of the booklet. Originally designed for short-term design projects or tasks, the EmotionProbe remains a valuable tool in those contexts. The EmotionProbe strength lies in its repeatability, enabling it to be used multiple times throughout the same design process. Design tutors can adapt their use according to their goals and timelines, gathering emotional data at different stages within a single project. The EmotionProbe can also be applied across multiple design projects, helping tutors compare emotional experiences and process patterns between projects based on the collected data.

#### *6.4.1.2 The Emotion Tracker*

The Emotion Tracker, on the other hand, offers a more expansive and longitudinal approach compared to the EmotionProbe. The Emotion Tracker was designed to track students' emotional experiences throughout longer design projects. Like the EmotionProbe, the tracker is easy to produce and follow, with a straightforward vertical layout on a single-page format that facilitates quick navigation. Students reported their emotions once a week, an approach intended to maintain consistency and avoid the fatigue or routine that daily tracking could cause. Once a week entries approach also allowed students to reflect on broader stages of the design process, which vary between individuals. This timing helped them recognise progression patterns and develop emotional awareness as a first step in understanding their full journey. A key strength of the tracker is its dual focus: it captures both emotional responses to design process stages and students' perceptions of their own achievements. This design encourages students not only to track their progress but also to reflect on how their emotional responses relate to outcomes and milestones. Serving as a year-long companion, the tracker allows students to physically observe their emotional

patterns and personal growth over time. Naming emotions was a new and eye-opening experience for all students; this encouraged self-reflection, and many students reported feeling more aware and empowered to recognise, change, and elaborate on their emotions.

These tools contribute to broader research efforts in emotion-informed design education. These tools serve not only to identify emotions during different stages of the design process but also to invite critical reflection on the reasons behind those emotions. This opens avenues for investigating emotional patterns in design learning and building emotionally supportive design educational environments.

Both tools offer researchers a straightforward means to organise, transcribe, and transform emotional data into structured formats like Excel spreadsheets, streamlining the process of analysis and insight generation. One of the strongest qualities of these tools is their simplicity in use, reproduction, data collection, and analysis, paired with the richness of the insights they provide. They may also be generalisable across any design discipline, including but not limited to product, graphic, print, fashion, animation, textile, etc., within different educational contexts globally, as they are not designed for a specific demographic but instead focus on the universal aspects of the design process. Another notable feature of both tools is the role of naming emotions. This aspect proved to be highly beneficial; by labelling their emotions, students gained a deeper understanding of their emotional engagement in the design process and the connection to their overall well-being. By making emotions visible, tangible, and non-judgmental, the tools help bridge communication gaps between students and tutors. They create new opportunities for supporting emotional well-being in design education. As Pekrun and Stephens (2010) emphasise, emotional awareness enhances learning outcomes and boosts student engagement.

#### *6.4.2 Second Contribution: New Understanding of Students' Design Process Emotional Experiences*

The data collected provided new insights and approved the importance of understanding students' emotional experiences during the design process. This research is part of a broader effort to highlight the emotional journey of designers in general, with a particular focus on students. The research emphasised the role emotions play in shaping students' decisions during transitions in the design process. Furthermore, the study described how emotions are perceived and interpreted by students from diverse cultural backgrounds and perspectives. The research also identified emerging emotional patterns and new emotional states specifically linked to the design process and the experiences of design students. Accordingly, this contribution can be seen in the following aspects:

#### 6.4.2.1 Identifying Links between Emotions while Designing

This research expanded the notion of the design process and emotional experiences by uncovering connections between the emotions reported by students. Traditionally, the relationships between emotions have been explored in the literature through various approaches. However, the contribution of this research lies in adding new layers that connect concepts within the design field and, more specifically, the students' design process and their emotional implications. This has led to the identification of new emotional links, some of which remain underexplored and uncategorised.

One notable discovery is the connection between four emotions: contentment, satisfaction, 'fine', and boredom. Students frequently reported feeling content or 'fine', and further elaboration and interpretation revealed deeper connections with satisfaction and boredom. These connections were clarified through students' reflections on what these labels meant to them and the underlying causes of these emotions. It became evident that students often reached a sense of contentment through satisfaction with their work, progress, and process. Conversely, students reported feeling 'fine' when experiencing boredom due to routine, lack of engagement, which causes procrastination. This led to a new understanding of these emotional connections, which are conventionally classified under the dimensions of valence and arousal. However, it became apparent that these emotions occupy a neutral zone, neither clearly pleasant/positive nor unpleasant/negative. Instead, they represent a kind of comfort zone where students may hide or mask deeper feelings.

Another emotional layer explored in this research is the word 'fine' as a distinct emotion. The study highlights 'fine' as a significant emotional marker within the design process. Although students acknowledged the term's ambiguity, their definitions and reflections showed that 'fine' often operates as a negatively neutral experience, marked by emotional disengagement, detachment, or stagnation. While not overtly negative, 'fine' can signal a loss of momentum and emotional investment in design work. An exciting contribution is the consistency in this interpretation across two cultural contexts: Jordan and Scotland. Students in both contexts associated similar meanings with the term. In Arabic, students mentioned expressions such as "منيحة" or "ماشى الحال," which have the same meaning of 'fine' used among the Scottish students. This finding contributes to a deeper understanding of how 'fine' is used and experienced across different cultural contexts and within design contexts.

An additional contribution of this research lies in the emotional links shaped by social and cultural understandings, such as the concept of shame, often emphasised in Middle Eastern cultures, and the expression of pride, which tends to be more pronounced in Western cultures. These culturally informed emotional dynamics further influence how students understand and express emotions within the design process.

### 6.4.2.2 *Revealing New Emotional Phenomena in Design*

This research introduces novel emotional understanding that emerge during the design process: the Emotionlessness State and the Design Neutral Schema. These phenomena offer a deeper understanding of how emotional disengagement manifests in students' design processes, particularly in response to the design process's iterative, messy, and non-linear reality, in which going back, rethinking, and jumping forward are the main characteristics.

The Emotionlessness State is defined as emotional detachment and a reduced sense of care or investment in one's design work. It is characterised by a lack of both positive and negative emotions, resulting in a numb engagement with the task at hand. Students experiencing this state often report difficulty assessing their own progress, a diminished motivation to reflect, and a sense of operating on autopilot. This state was frequently observed in longer-term projects, suggesting that emotional detachment may be linked to prolonged exposure, burnout, or a loss of interest in the design task (see 4.4.4, pp. 262).

While the Design Neutral Schema (DNS) represents the emotions that led to the state of emotionlessness. DNS is not defined by the absence of emotion, but rather by a convergence of multiple subtle emotions into a broader experience of emotional neutrality. This state reflects a phenomenological relation wherein emotional presence gradually fades, moving along a continuum of deactivation. Importantly, this schema is not emotionally void; where contentment suggests a positive neutrality with undertones of comfort, while 'fine' signals a negative neutrality shaped by detachment or resignation. This neutral experience tends to emerge when emotional activation decreases and students begin to distance themselves from their work (see Figure 5-7, 5.3.1, p.329).

Together, the Emotionlessness State and the Design Neutral Schema offer a new lens to understand emotional disengagement in design education. They highlight how emotions in design are not always characterised by intensity or volatility, but can also be marked by subtle forms of detachment that shape students' motivations, critical thinking, and capacity for reflection.

Design students often hesitate right from the get-go, just figuring out how to start, define a topic, or form a concept. Then they run into issues with research, planning, managing their time, actually making the thing, and embodying the design. They can feel lost and disoriented. In addition, students' lack of deep experience means their judgment isn't quite there. By identifying these emergent phenomena, this research contributes a novel vocabulary for analysing the emotional dimensions of the design process, particularly under conditions of duration, project type, and impacting factors.

### *6.4.2.3 New Approach to Revealing Emotional Patterns during the Design Process*

This study offers a novel contribution to the field of design and emotion by mapping emotional patterns across distinct stages of the design process. By identifying emotions associated with each stage, this research highlights not only the characteristics of these stages but also the specific factors that influence students' emotional experiences and decision-making as they progress through their projects. The decision-making here refers to how students navigated and managed their transitions between stages of the design process.

A key contribution lies in identifying emotional imbalances within the design journey. The imbalance manifests in design stage transitions and uneven emotional distribution. The findings reveal a recurrent pattern in which students begin their process with high levels of positivity, particularly during the initial exploratory phases. However, this early engagement often leads to stagnation, as students demonstrate reluctance to transition toward more demanding stages that require refined decision-making and a clear design direction. This emotional inertia contributes to prolonging the early stages at the expense of deeper developmental phases. As students advance, the middle stages of the process are frequently marked by emotional neutrality or disengagement. This phase is characterised by a notable absence of emotional activation, with students reporting a sense of detachment and lack of motivation. This disengagement functions as a coping mechanism in response to uncertainty, stress, or fear of failure, ultimately leading to a loss of momentum and a diminished sense of agency. Toward the end of the process, emotional strain resurfaces, manifesting as frustration and anxiety, particularly under the pressure of finalising and justifying their design outcomes.

These intense emotions, rather than being harnessed constructively, often lead to emotional stagnation or collapse. This unbalanced pattern from early positivism, through mid-process detachment, to end-stage stress provides valuable insights into the emotional dynamics of design students, uncovering patterns that challenge the assumption of linear, evenly motivated design journey. This discovery calls for a more emotionally attuned approach to design education that supports students in navigating emotional experiences with greater awareness and adaptability.

### *6.4.3 Third Contribution: Promoting and Rethinking the Integration of Emotion within Design Education*

Design is seen as a decision-making process in which designers always use their knowledge, experience, prior design examples, and speculation. However, decision-making isn't purely rational; the emotional systems can help make decisions more quickly and effectively and avoid getting bogged down in endless loops. So emotions aren't just noise getting in the way; they can facilitate good choices. Emotions can help prioritise, focus, and make judgments when the rational information is overwhelming or incomplete. This research contributes to highlighting the impact of students' emotions on their decisions regarding their design process progress and moving forward. Therefore, the contribution can be seen as follows:

#### *6.4.3.1 Creating the Awareness of Emotions as a Normal and Strategic Part of Design Education*

This study contributes to the ongoing discourse on emotional awareness in design education by normalising students' emotional experiences during the design process. Through reflective exercises and tracking, students became aware, many for the first time, of the emotional dimensions shaping their design journey. The study highlights that emotions are not isolated to everyday life but are integral to how students engage with, progress through, and make decisions within their design practice.

A key contribution lies in positioning emotional awareness as a foundational skill that should be taught and cultivated, not merely advised. While tutors may offer guidance for emotional regulation, this research emphasises the necessity of structured educational interventions that allow students to develop self-awareness and emotional regulation from within. This approach enables students to better manage and harness their emotions, even when controllable and uncontrollable factors influence them.

Equally important is the recognition that students need to understand they will inevitably experience a range of emotions throughout their design journey. Rather than treating these emotions as distractions or problems to avoid, this study proposes embracing them as a natural part of the design process. To support this, the design education environment must actively create inclusive spaces where students can share their emotional experiences openly. In such spaces, some emotions can be guided and supported through pedagogical methods, while others require students to build their own capacity for awareness and self-regulation over time.

Moreover, this work supports the idea that emotional reflection can be a gateway to greater self-understanding and suggests potential for future research into developing affective tools and methods suitable for understanding the diversity of these emotional experiences within the design context. By presenting emotions not as obstacles but as dynamic forces that can be channelled into powerful design tools, this study offers a shift in perspective: emotional fluctuation is not a sign of weakness or failure but a natural, valuable part of the design process.

#### *6.4.3.2 Promoting and Rethinking Anger as a Design Strategy*

Conventionally, anger is seen as a disruptive or negative force that often leads to its suppression in professional and educational settings. This research proposes a novel reframing of anger as a productive design strategy within design education, positioning anger not as an emotion to be suppressed or managed but as a powerful tool for designing, critical engagement, and emotional development. While emotion is increasingly acknowledged as a significant factor in learning, affecting motivation, problem-solving, and self-efficacy, educational frameworks such as Social and Emotional Learning (SEL) and Action Learning have yet to meaningfully integrate emotional dynamics, particularly those considered

disruptive, such as anger. This research argues for deliberately including anger in design pedagogies, offering new pathways to emotional resilience, reflective practice, and value-driven design.

By reconceptualising anger as emotional energy, the research demonstrates how it can interrupt emotional disengagement, support decision-making, and foster moral, political, social, economic, environmental awareness among students. This research contributes to the field by introducing design-specific strategies for engaging with anger constructively: these include emotional mapping, anger-focused reflection prompts, and critique structures that normalise emotional friction as integral to the design process. Provocative techniques such as rule-breaking, embodied expression, and emotionally charged briefs are also proposed to elicit anger intentionally as a design prompt. Furthermore, the research extends current understandings of experiential learning by highlighting the affective dimension often overlooked in some educational frameworks. The research proposes an expanded perspective in which experiential design projects also serve as emotional laboratories, spaces where students can confront, express, and learn from strong emotions, including anger. This approach opens new possibilities for emotionally engaged design education, particularly for novice students, by cultivating emotional literacy, critical reflection, and social responsibility.

This research offers a contribution to design pedagogy by advocating for an emotional turn that foregrounds anger as a legitimate and generative force within the design studio and beyond.

## 6.5 Research Impact

This research mainly impacts design students, as it encourages them to recognise and navigate their emotional experiences throughout the design process. By understanding the origins and meanings behind their emotions, students can deepen their engagement with design projects and develop greater self-awareness. This emotional insight fosters reflective practices that not only enrich their academic work but also prepare them for emotionally complex situations in professional design settings. Ultimately, this contributes to shaping more emotionally attuned and resilient future designers.

The findings provide a valuable entry point for design tutors to understand how emotions influence students' learning, design process, and development. The research supports tutors in creating emotion-centred design learning environments that acknowledge and make use of the emotional experiences as part of the design process. The research encourages tutors to design pedagogical strategies and project briefs that integrate emotional exploration, fostering deeper classroom engagement and supporting more meaningful educational experiences.

Within the broader context of design education, this research contributes to the evolving discourse around affect and design. The research challenges the traditional separation of emotion from design thinking, proposing instead that emotion is a central and productive part of the process. By emphasising the role of emotional experiences, the study suggests curriculum development that encourages emotional literacy alongside technical and conceptual skill-building. This holistic approach enriches the educational framework and better reflects the lived experiences of design work.

In the design profession, the insights from this research are equally applicable. They promote a more emotionally aware practice where designers are encouraged to reflect on their affective responses to challenges, clients, and users. Such awareness can design collaboration in professional contexts. Moreover, emotionally informed designers are better equipped to manage stress, navigate ambiguity, and approach complex design problems with a nuanced understanding of both their own emotions and those of others.

## 6.6 Research Limitation

This study presents several limitations that should be considered while interpreting the findings. One key limitation concerns the method used to capture emotional responses, which relied on a fixed list of predefined emotions. While the 'other' option was provided to allow students to specify additional emotion experiences, the structure nonetheless constrained the emotional range that students could express. This limitation was evident when students identified important emotions, such as excitement, that were not initially included in the list. As such, while the framework used to analyse the data may be suitable for certain contexts, its restricted emotional scope may not fully reflect the complexity of emotional experiences in design education.

A methodological limitation also emerged during the main study, where students were asked to rate the intensity of five predefined emotions related to their design process activity experience. Two specific issues arose in this process. First, all students were asked to rate each emotion, regardless of whether they had actually experienced this emotion. This may have unintentionally pressured students to evaluate emotions they did not feel, potentially skewing the results. Second, the rating scale lacked a zero point to indicate the absence of an emotion. Although some students addressed this by leaving a score blank or writing in a zero, the lack of a clearly defined option for "not felt" may have compromised the accuracy of the data. Additionally, the first section of the emotion tracker focused solely on the intensity of emotional responses, whereas capturing the frequency or repetition of emotions could have provided a more holistic view of the participants' experiences.

The analytical framework used in the study also presents limitations. By organising emotions into a limited number of categories, Pekrun's (2007) framework may have oversimplified the emotional landscape relevant to the design process. This reduction was especially noticeable when students were asked to suggest additional emotions, and many expressed the feeling that the available categories did not fully capture their experiences. This feedback highlights that the framework may not be ideally suited for application within design education, even though it may have utility in other fields.

Another important limitation relates to the inherently subjective nature of the study. The data relied heavily on students' self-reported emotional experiences and did not rely on a statistical approach. Although this approach aligns with the interpretive goals of the research, it may raise concerns for scholars who prioritise empirical validation. As critical realists argue, the role of statistical evidence is not to assert universal truths but to complement causal reasoning and enhance the reliability and validity of findings (Downward et al., 2002). Without such complementary data, the findings of this study may be viewed as less robust, particularly in research domains that value generalisability.

Finally, the students' emotional readiness and awareness also posed a limitation. Many students entered the study with little prior experience in identifying or articulating their emotions. For some, this unfamiliarity led to feelings of discomfort when asked to engage in emotional reflection. As a result, the depth and accuracy of the data may have been affected by students' limited emotional literacy. This points to the need for greater preparatory work in developing emotional awareness when conducting similar studies in the future.

## 6.7 Future Work

This doctoral research opens several new pathways for future inquiry in the field of design and design education, particularly in relation to emotional experiences. The findings and methodologies developed throughout this study lay a foundation for broader investigations that can further shape how emotional engagement is understood and utilised in creative learning environments.

One immediate area for future research involves expanding the development of the cultural probes used in this study. While they proved valuable in capturing emotional responses, they also revealed certain limitations. Enhancing these tools, through iterative design, testing, and refinement, could lead to more robust tools capable of collecting richer, context-specific data within design studios and classrooms. These improved tools could better accommodate diverse emotional responses and be adapted to various educational settings, ultimately supporting more inclusive emotional inquiry.

Another promising direction is creating a structured design project that intentionally integrates students' emotional experiences into the design process. This type of project would focus on making emotion a central design component, allowing researchers and tutors to observe how emotional awareness impacts students' design process, decision-making, and outcomes. A comparative study could be conducted between projects that incorporate emotional prompts and those that do not, offering insights into the value of emotion-centred design education and its potential influence on student engagement and project quality.

Further empirical research is also needed to examine the specific role of anger in design learning environments. This includes investigating the different meanings and types of anger, how they manifest in design contexts, and how they can be constructively integrated into educational frameworks. Such work could explore the intersection of anger with action learning strategies, where emotions become catalysts for reflection, motivation, and collaboration. Understanding how anger might be reframed from a disruptive emotion to a productive force can help challenge dominant narratives within education. A related avenue involves exploring strategies for deeply embedding emotional awareness into the design curriculum and pedagogy. This would include not only acknowledging the presence of emotions in design practice but also providing students with tools and frameworks to identify, express, and reflect on their emotions throughout the design process. Developing emotional literacy in parallel with design skills can empower students to navigate challenges, critique more deeply, and develop more meaningful work.

Another direction of interest lies in examining neutral emotional states and their relationship to design flow and broader flow theory. This line of inquiry would explore how neutral emotions may enable, disrupt, or transition into states of flow during design activity, as well as how these states coexist with or shift toward heightened emotions such as anger. Pursuing this direction would expand the current work by positioning the emotional experiences within a more holistic framework in design practice and design education. In addition, more attention should be paid to neutral or ambiguous emotions during the design process. Often, these emotions are overlooked or not considered in the traditional sense. However, they may significantly shape students' behaviours, habits, and design journey. By investigating these grey areas, future studies can offer a more comprehensive understanding of the emotional landscape of design education and challenge existing definitions of what counts as an emotion.

Cultural perspectives on emotion also warrant further study. Since emotional expression and interpretation vary across cultures, future research should seek to understand how cultural background influences emotional experiences in design education. This would help avoid misrepresenting or miscommunicating emotional cues and support the development of culturally sensitive educational approaches. Moreover, gaining insight into what constitutes pleasant and unpleasant emotional experiences across cultures can expand the inclusivity of emotional design strategies.

Lastly, an important area of exploration is understanding how students define and interpret emotion themselves. Investigating students' personal perspectives on emotion can help uncover hidden networks of meaning, patterns, and emotional connections that are not immediately visible through standardised research tools. These insights can inform the development of new emotional frameworks that are better aligned with students' lived experiences.

## 6.8 Final Remark

After exploring a range of design processes, approaches, and focal points, it has become clear that the current shift toward user-centred design often overlooks a crucial component: the designer themselves and their role within the process. While research has rightly emphasised the importance of understanding and empathising with users, this has created a noticeable gap, one that calls for renewed attention to the designer as the driving force behind the work. This means recognising and integrating their emotions, experiences, and intuition into the design framework. In particular, it is vital to address this dimension early in design education, helping future designers to see emotional awareness not as an afterthought but as a fundamental part of their process. Historically, design methodologies have mainly missed the emotional dimension of the designer. But in a world marked by rapid change, uncertainty, and crisis, this blind spot can no longer be justified. Designers continue to carry the weight of imagining and shaping solutions for increasingly complex global challenges. Supporting their emotional engagement is not only necessary, but it is essential for fostering a more holistic, resilient, and responsible design practice that goes beyond the user, is a future-focused (Cooper, 2018) and consider compassionate design approach (Papanek, 1971) that guide design students to more responsible design (Cooper, 2021).

Emotions are deeply embedded in every stage of the designer's journey, shaping decisions and actions in subtle yet powerful ways. This is especially true for students, who may not yet have the tools to recognise or articulate the emotional layers of their work. Managing a design process is inherently complex, and for students, the added difficulty of navigating emotional responses, without guidance, can hinder their progress and confidence. This highlights a pressing need to adapt educational frameworks to include emotional literacy: the capacity to understand, accept, and work with students' emotions as part of the design process. Rather than suppressing emotions, students should be encouraged to acknowledge them and learn how to regulate their influence. Doing so not only strengthens emotional resilience but also improves decision-making. Greater emotional awareness allows students to identify how feelings shape their workflows, their moments of struggle, and their creative breakthroughs.

With these insights in mind, this doctoral research aims to expand the conversation and invite students, tutors, and practitioners alike to reconsider what is often left unspoken yet has a profound impact on design: the designer's emotional experiences. Emotions are not peripheral to design; they are integral. Bringing them into focus creates the places for more honest, reflective, and transformative design practices

So, take a moment now, **WHAT ARE YOU FEELING, CAN YOU NAME IT?**

Just notice that's a powerful place to end, and perhaps, to begin...







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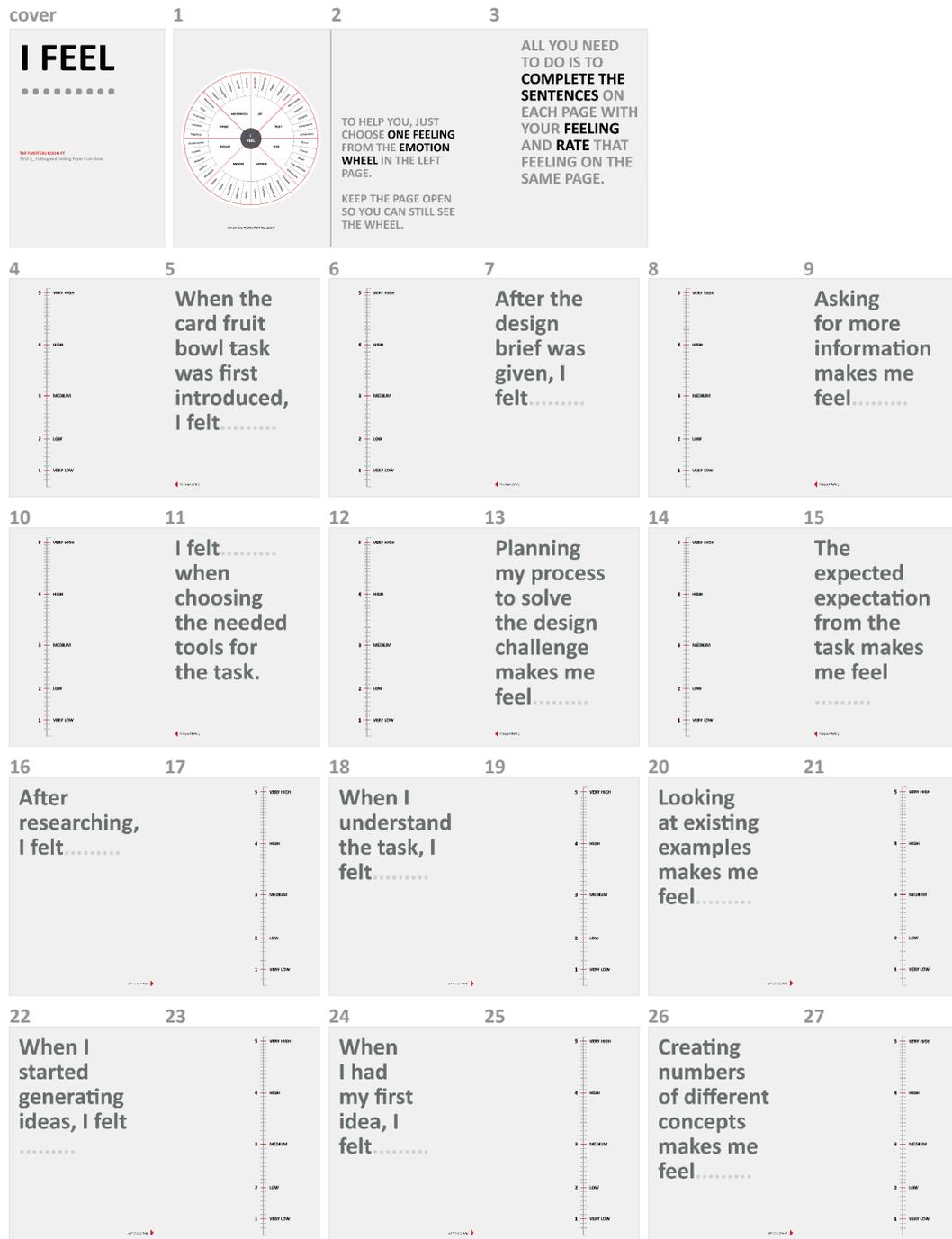
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## Appendix 1. EmotionProbe Flat Plan



28 I felt .....  
about my initial design solution.

29

30 I felt .....  
after I saw my classmates' designs.

31

32 I felt .....  
when I created my demo paper prototype.

33

34 I feel .....  
sharing my idea with my classmates

35

36 Going back to my idea after being away from it, I felt .....

37

38 After I tested my model, I felt .....

39

40 The trial and error phase, makes me feel .....

41

42 Using less tape makes me feel .....

43

44 When applying the dimensions to my design, I feel .....

45

46 When I tried to enhance my model, I felt .....

47

48 Being precise and accurate with hand-made-model makes me feel .....

49

50 After I completed my card model, I felt .....

51

52 I feel .....  
working with others to manufacture my model.

53

54 I feel .....  
after submitting my task.

55

56 I feel .....  
hearing feedback about my design.

57

58 PLEASE WRITE YOUR DETAILS

59

60 (back cover)

HOW DO YOU FEEL NOW

.....

THANK YOU!













## Appendix 4. Emotion Tracker Front and Back Pages

### First Semester (InsidePage)

**Q1. In which stage you are working now based on your project semester timeline?**  
 (Please shade the box; you can leave the box empty if you don't do anything during the week (Holiday, week-off, etc.))

| Design Process Stages        | W1 | W2 | W3 | W4 | W5 | W6 | W7 | W8 | W9 | W10 | W11 | W12 | W13 | W14 | W15 | W16 | W17 |
|------------------------------|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| Design Brief & Specification |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Research                     |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Concept Design               |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Design Development           |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Detail Design (Testing)      |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Production                   |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |

**Q2. Mark the level of each emotion towards the design stages that happened each week.**  
 (scale: 1= very low, 2= low, 3= medium, 4= high, 5= very high)

|             |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Enjoyment   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Relaxation  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Anger       |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Frustration |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Boredom     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Q3. Choose one emotion (Joy, Hope, Contentment, Relief, Anxiety, Shame, Sadness, Disappointment) to respond to the following statements for each week.**

|   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| How do you feel about your design project progress.   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| How do you feel about your project workload at this stage.  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| How do you feel about the skills you gained previously in developing your current project.                  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| How do you feel about your project contribution in enhancing your knowledge and skills for future projects. |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| How do you feel about the chance you have to explore ideas and concepts in depth.                           |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| How do you feel about your achieved learning outcomes in this week.   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| How do you feel about the feedback you have received at this stage of your project.                         |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

THANK YOU!

**Hello.....**

This is the tracker tool, aiding in the exploration of your emotions throughout your design process. Please assist me in gathering more data so that I can delve deeper into these emotions. Let's work together to harness the true potential of emotions in your creative endeavours.

**EMOTION TRACKER**

design

process

activity

outcome

Please Write Your Details

Name .....

Gender .....

Age .....

Email .....

Study Year Level .....

SELF-REPORT TOOL

Second Semester (Inside Page)

**Q1. In which stage are you working on now based on your project semester timeline?**  
 (Please shade the box, you can leave the box empty if you don't do anything during the week (Holiday, week-off, etc.)

| Design Process Stages        | W1 | W2 | W3 | W4 | W5 | W6 | W7 | W8 | W9 | W10 | W11 | W12 | W13 | W14 | W15 | W16 | W17 |
|------------------------------|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| Design Brief & Specification |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Research                     |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Concept Design               |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Design Development           |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Detail Design (Testing)      |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |
| Production                   |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |

**Q2. Mark the level of each emotion towards the design stages that happened each week.**  
 (scale: 1= very low, 2= low, 3= medium, 4= high, 5= very high)

|                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Enjoyment       |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Relaxation      |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Anger           |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Frustration     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Boredom         |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| other (mention) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| other (mention) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Q3. Choose one emotion (Joy, Hope, Contentment, Relief, Anxiety, Shame, Sadness, Disappointment, Other (mention)) to respond to the following statements for each week.**

|   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| How do you feel about your design project progress.   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| How do you feel about your project workload at this stage.  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| How do you feel about the skills you gained previously in developing your current project.                  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| How do you feel about your project contribution in enhancing your knowledge and skills for future projects. |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| How do you feel about the chance you have to explore ideas and concepts in depth.                           |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| How do you feel about your achieved learning outcomes in this week.   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| How do you feel about the feedback you have received at this stage of your project.                         |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

THANK YOU!  
 Second Semester Data

Student Name:

# EMOTION TRACKER

Hello.....

This is the tracker tool, aiding in the exploration of your emotions throughout your design process. Please assist me in gathering more data so that I can delve deeper into these emotions. Let's work together to harness the true potential of emotions in your creative endeavours.

Please get in touch in case needed  
 Hazar Marji  
 DMEM, Leonardo Suite  
 JMC08  
 hazar-talssier-eld-marji@strath.ac.uk  
 +962 798430335

design

process

activity

outcome

### Please Write Your Details

Name .....

Gender .....

Age .....

Email .....

Study Year Level .....

SELF-REPORT TOOL

# Appendix 5. Emotion Tracker Raw Dataset

## Question One: Design Procecs Stages per Week

| Section One: Question One   |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
|-----------------------------|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
|                             | W1 | W2 | W3 | W4 | W5 | W6 | W7 | W8 | W9 | W10 | W11 | W12 | W13 | W14 | W15 | W16 | W17 | W18 | W19 | W20 | W21 | W22 | W23 | W24 | W25 | W26 | W27 | W28 | W29 | W30 |    |
| <b>Design Process Stage</b> |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
| Research                    | 5  | 18 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24  | 24  | 24  | 24  | 24  | 24  | 24  | 24  | 24  | 24  | 24  | 24  | 24  | 24  | 24  | 24  | 24  | 24  | 24  | 24  | 24  | 24 |
| Concept Design              | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0  |
| Design Development          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0  |
| Detailed Design             | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0  |
| Production                  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0  |
| Nowork                      | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0  |
| <b>Design Process Stage</b> |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
| Research                    | 4  | 8  | 11 | 10 | 9  | 10 | 6  | 2  | 6  | 3   | 2   | 2   | 3   | 4   | 6   | 6   | 4   | 2   | 3   | 1   | 2   | 2   | 2   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 0  |
| Concept Design              | 2  | 2  | 4  | 4  | 4  | 4  | 3  | 2  | 2  | 2   | 2   | 2   | 3   | 4   | 5   | 5   | 2   | 2   | 3   | 8   | 7   | 8   | 7   | 9   | 8   | 4   | 5   | 2   | 2   | 2   | 0  |
| Design Development          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0  |
| Detailed Design             | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0  |
| Production                  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0  |
| Nowork                      | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0  |

















## Appendix 7. Interview Codes Schema Distribution

| Code Type | Codes                             | Groundedness |
|-----------|-----------------------------------|--------------|
| Axial     | • Interview Questions             | 942          |
| Axial     | • Emotional Experiences           | 751          |
| Open      | • emotional state                 | 511          |
| Axial     | • Linking, Concept Intersection   | 417          |
| Open      | • design process emotors          | 385          |
| Axial     | • Sentiment                       | 372          |
| Axial     | • Emotional Drivers               | 285          |
| Axial     | • Design Emotions                 | 228          |
| Open      | • positive                        | 196          |
| Axial     | • Interpretation                  | 176          |
| Open      | • meaning                         | 161          |
| Open      | • negative                        | 153          |
| Axial     | • Tracking                        | 147          |
| Axial     | • Education Aspect                | 140          |
| Axial     | • Emotional Dynamics              | 136          |
| Open      | • feedback impact                 | 113          |
| Open      | • design process stages           | 105          |
| Open      | • question 2                      | 94           |
| Open      | • question 10                     | 94           |
| Open      | • emotionlessness state           | 89           |
| Open      | • tracking importance             | 84           |
| Open      | • question 4                      | 83           |
| Open      | • question 12                     | 81           |
| Open      | • tracker feedback                | 81           |
| Axial     | • Design Process                  | 76           |
| Open      | • support                         | 75           |
| Open      | • Fine                            | 73           |
| Open      | • question 1                      | 72           |
| Open      | • question 9                      | 68           |
| Open      | • question 11                     | 67           |
| Axial     | • Anger in Design                 | 66           |
| Open      | • question 6                      | 66           |
| Open      | • question 13                     | 64           |
| Open      | • contentment                     | 63           |
| Open      | • emotion regulation              | 60           |
| Open      | • question 3                      | 60           |
| Open      | • supervisor relationship         | 57           |
| Open      | • question 8                      | 57           |
| Open      | • jealousy                        | 55           |
| Open      | • educational aspect              | 55           |
| Open      | • success vs. failure             | 51           |
| Open      | • question 5                      | 51           |
| Axial     | • Motivation Dynamics             | 51           |
| Open      | • anger state                     | 49           |
| Open      | • characteristic                  | 46           |
| Open      | • question 14                     | 46           |
| Open      | • final emotion                   | 45           |
| Open      | • question 7                      | 44           |
| Open      | • comparison                      | 44           |
| Open      | • project relationship            | 43           |
| Open      | • factors impact                  | 40           |
| Open      | • emotion role                    | 40           |
| Open      | • challenge                       | 40           |
| Open      | • organisation/planning           | 39           |
| Open      | • project ownership               | 37           |
| Open      | • external factor impact          | 37           |
| Open      | • question 15                     | 37           |
| Open      | • communication                   | 36           |
| Open      | • setbacks impact                 | 35           |
| Open      | • overcome                        | 35           |
| Open      | • tracking honesty                | 35           |
| Open      | • emotion enhancement             | 34           |
| Open      | • escape                          | 33           |
| Open      | • emotion fluctuations            | 31           |
| Open      | • neutral                         | 30           |
| Open      | • progress impact                 | 29           |
| Open      | • anger causes                    | 28           |
| Open      | • decision making                 | 23           |
| Open      | • other emotions                  | 23           |
| Open      | • connections                     | 22           |
| Open      | • unknown/uncertainty             | 19           |
| Open      | • recall                          | 19           |
| Open      | • understanding                   | 19           |
| Open      | • marking & grading               | 18           |
| Open      | • time period                     | 16           |
| Open      | • procrastination                 | 15           |
| Open      | • anger vs. frustration           | 14           |
| Axial     | • Emotion & Language              | 14           |
| Open      | • frustration                     | 12           |
| Open      | • education environment and setup | 12           |
| Open      | • reasons                         | 12           |
| Open      | • anger vs. other emotions        | 11           |
| Open      | • excitement                      | 11           |
| Open      | • outsource                       | 11           |
| Open      | • fear                            | 10           |
| Open      | • caring/caring                   | 10           |
| Open      | • confidence                      | 10           |
| Open      | • arabic equivalent               | 9            |
| Open      | • mix of emotion                  | 7            |
| Open      | • anger as motivator              | 6            |
| Open      | • language reason                 | 6            |
| Open      | • emotion confusion               | 6            |
| Open      | • boredom                         | 5            |
| Open      | • insecure                        | 5            |
| Open      | • research                        | 5            |
| Open      | • learning                        | 5            |
| Open      | • journaling                      | 5            |
| Open      | • hope                            | 4            |
| Open      | • joy                             | 4            |
| Open      | • satisfaction                    | 4            |
| Open      | • structure/requirements          | 4            |
| Open      | • pressure                        | 4            |
| Open      | • repetition                      | 4            |
| Open      | • anger vs. disappointment        | 3            |
| Open      | • positive anger                  | 3            |
| Open      | • weather                         | 3            |
| Open      | • current moment                  | 3            |
| Open      | • difference                      | 3            |
| Open      | • memory                          | 3            |
| Open      | • anger vs. jealousy              | 2            |
| Open      | • anger vs. passion               | 2            |
| Open      | • full                            | 2            |
| Open      | • passion                         | 2            |
| Open      | • routine                         | 2            |
| Open      | • writing                         | 2            |
| Open      | • good                            | 1            |
| Open      | • shame                           | 1            |
| Open      | • breaking rules                  | 1            |
| Open      | • concept                         | 1            |
| Open      | • submission                      | 1            |
| Open      | • trial and error                 | 1            |
| Open      | • visualisations                  | 1            |
| Open      | • work                            | 1            |
| Open      | • expectation                     | 1            |
| Open      | • fake                            | 1            |
| Open      | • no communication                | 1            |
| Open      | • originality                     | 1            |
| Open      | • rejection                       | 1            |
| Open      | • stress                          | 1            |
| Open      | • setting goals                   | 1            |
| Open      | • smiling                         | 1            |
| Open      | • trigger                         | 1            |

# Appendix 8. Interview Codes Schema Categorisation

| Open Codes                      | Axial Codes                         | Selective Codes                     |                                     |                                     |
|---------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
|                                 |                                     | Theme One                           | Theme Two                           | Theme Three                         |
| anger as motivator              | Design Emotions                     | Emotional Reflection and Expression | Design Process and Design Project   |                                     |
| anger causes                    |                                     | Emotional Reflection and Expression | Design Process and Design Project   |                                     |
| anger state                     |                                     | Emotional Reflection and Expression | Design Process and Design Project   |                                     |
| anger vs. disengagement         |                                     | Emotional Reflection and Expression | Design Process and Design Project   |                                     |
| anger vs. other emotions        |                                     | Emotional Reflection and Expression | Design Process and Design Project   |                                     |
| anger vs. passion               |                                     | Emotional Reflection and Expression | Design Process and Design Project   |                                     |
| positive anger                  |                                     | Emotional Reflection and Expression | Design Process and Design Project   |                                     |
| boredom                         |                                     | Design Process and Design Project   |                                     |                                     |
| contentment                     |                                     | Design Process and Design Project   |                                     |                                     |
| excitement                      |                                     | Design Process and Design Project   |                                     |                                     |
| fast                            |                                     | Design Process and Design Project   |                                     |                                     |
| fine                            |                                     | Design Process and Design Project   |                                     |                                     |
| frustration                     |                                     | Design Process and Design Project   |                                     |                                     |
| good                            |                                     | Design Process and Design Project   |                                     |                                     |
| hope                            |                                     | Design Process and Design Project   |                                     |                                     |
| insecure                        |                                     | Design Process and Design Project   |                                     |                                     |
| jealousy                        |                                     | Design Process and Design Project   |                                     |                                     |
| joy                             |                                     | Design Process and Design Project   |                                     |                                     |
| satisfaction                    |                                     | Design Process and Design Project   |                                     |                                     |
| shame                           |                                     | Design Process and Design Project   |                                     |                                     |
| breaking rules                  |                                     | Design Process and Design Project   |                                     |                                     |
| concept                         |                                     | Design Process and Design Project   |                                     |                                     |
| decision making                 |                                     | Design Process and Design Project   |                                     |                                     |
| final emotion                   |                                     | Design Process and Design Project   |                                     |                                     |
| research                        |                                     | Design Process and Design Project   |                                     |                                     |
| submission                      | Design Process and Design Project   |                                     |                                     |                                     |
| trial and error                 | Design Process and Design Project   |                                     |                                     |                                     |
| visualisations                  | Design Process and Design Project   |                                     |                                     |                                     |
| education environment and setup | Education Aspect                    |                                     |                                     | Emotional Feedback & Recommendation |
| educational aspect              |                                     |                                     |                                     | Emotional Feedback & Recommendation |
| project ownership               |                                     |                                     |                                     | Emotional Feedback & Recommendation |
| project relationship            |                                     |                                     |                                     | Emotional Feedback & Recommendation |
| structure/requirements          |                                     |                                     | Emotional Feedback & Recommendation |                                     |
| supervisor relationship         | Emotion & Language                  | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| arabic equivalent               |                                     | Emotional Reflection and Expression | Design Process and Design Project   |                                     |
| language reason                 |                                     | Design Process and Design Project   |                                     |                                     |
| external factor impact          |                                     | Design Process and Design Project   |                                     |                                     |
| factors impact                  | Emotional Drivers                   | Design Process and Design Project   |                                     |                                     |
| feedback impact                 |                                     | Design Process and Design Project   |                                     |                                     |
| progress impact                 |                                     | Design Process and Design Project   |                                     |                                     |
| retroactive impact              |                                     | Design Process and Design Project   |                                     |                                     |
| success vs. failure             | Design Process and Design Project   |                                     |                                     |                                     |
| unknown/uncertainty             | Design Process and Design Project   |                                     |                                     |                                     |
| weather                         | Design Process and Design Project   |                                     |                                     |                                     |
| work                            | Design Process and Design Project   |                                     |                                     |                                     |
| emotion confusion               | Emotional Dynamics                  | Emotional Reflection and Expression |                                     |                                     |
| emotion enhancement             |                                     | Emotional Reflection and Expression |                                     |                                     |
| emotion fluctuations            |                                     | Emotional Reflection and Expression |                                     |                                     |
| emotion regulation              |                                     | Emotional Reflection and Expression |                                     |                                     |
| emotion role                    | Emotional Reflection and Expression |                                     |                                     |                                     |
| mix of emotion                  | Emotional Reflection and Expression |                                     |                                     |                                     |
| design process emotions         | Emotional Experiences               | Emotional Reflection and Expression |                                     |                                     |
| design process stages           |                                     | Emotional Reflection and Expression |                                     |                                     |
| emotional state                 |                                     | Emotional Reflection and Expression |                                     |                                     |
| emotionlessness state           |                                     | Emotional Reflection and Expression |                                     |                                     |
| characteristic                  | Interpretation                      | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| meaning                         |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| Interview Questions question 3  |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| Interview Questions question 2  |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| Interview Questions question 1  | Interview Questions                 | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| Interview Questions question 4  |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| Interview Questions question 5  |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| Interview Questions question 6  |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| Interview Questions question 7  |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| Interview Questions question 8  |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| Interview Questions question 9  |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| Interview Questions question 10 |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| Interview Questions question 11 |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| Interview Questions question 12 |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| Interview Questions question 13 |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| Interview Questions question 14 |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| Interview Questions question 15 |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| learning                        |                                     | Linking Concept Intersection        | Emotional Reflection and Expression | Design Process and Design Project   |
| challenge                       | Emotional Reflection and Expression |                                     | Design Process and Design Project   | Emotional Feedback & Recommendation |
| communication                   | Emotional Reflection and Expression |                                     | Design Process and Design Project   | Emotional Feedback & Recommendation |
| comparison                      | Emotional Reflection and Expression |                                     | Design Process and Design Project   | Emotional Feedback & Recommendation |
| confidence                      | Emotional Reflection and Expression |                                     | Design Process and Design Project   | Emotional Feedback & Recommendation |
| connections                     | Emotional Reflection and Expression |                                     | Design Process and Design Project   | Emotional Feedback & Recommendation |
| current moment                  | Emotional Reflection and Expression |                                     | Design Process and Design Project   | Emotional Feedback & Recommendation |
| difference                      | Emotional Reflection and Expression |                                     | Design Process and Design Project   | Emotional Feedback & Recommendation |
| escape                          | Emotional Reflection and Expression |                                     | Design Process and Design Project   | Emotional Feedback & Recommendation |
| expectation                     | Emotional Reflection and Expression |                                     | Design Process and Design Project   | Emotional Feedback & Recommendation |
| fake                            | Emotional Reflection and Expression |                                     | Design Process and Design Project   | Emotional Feedback & Recommendation |
| learning                        | Emotional Reflection and Expression |                                     | Design Process and Design Project   | Emotional Feedback & Recommendation |
| lull                            | Emotional Reflection and Expression |                                     | Design Process and Design Project   | Emotional Feedback & Recommendation |
| marking & grading               | Emotional Reflection and Expression |                                     | Design Process and Design Project   | Emotional Feedback & Recommendation |
| memory                          | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| no communication                | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| organisation/planning           | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| originality                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| other emotions                  | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| outsourcing                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| passion                         | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| pressure                        | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| procrastination                 | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| reasons                         | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| recall                          | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| rejection                       | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| repetition                      | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| routine                         | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| sense                           | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| setting goals                   | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| support                         | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| time period                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| trigger                         | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| understanding                   | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
| motivation                      | Motivation Dynamics                 | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| negative                        |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| neutral                         |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| positive                        |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| journaling                      | Tracking                            | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| teacher feedback                |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| honesty                         |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| importance                      |                                     | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |
| writing                         | Emotional Reflection and Expression | Design Process and Design Project   | Emotional Feedback & Recommendation |                                     |
|                                 |                                     | codegroup 1                         | codegroup 2                         | codegroup 3                         |



# Appendix 10. Feedback Sheet-Google Forms

## Semester One

**Section 1 of 7**

### FBS\_Emotional Experiences of Design Students Study\_ One Year Tracking\_Phase 1\_2023

This feedback represents questions related to the emotion tracking study conducted as a part of research aimed at fulfilling the requirements for a PhD degree in Design and Emotion.

After section 1 Continue to next section

**Section 2 of 7**

#### Participants Information

Description (optional)

**Student Name \***

Long answer text

**Gender \***

Short answer text

**Age \***

Short answer text

**Study Year Level \***

3rd Year student

4th Year student

5th Year Student

6th Year student

**University Name \***

German Jordanian University

University of Strathclyde

After section 2 Continue to next section

**Section 3 of 7**

#### Tool Usability and Reliability

Description (optional)

**Do you think the emotions listed in the tracker are enough to express your emotional experience(s) while designing?**

Yes

No

**In your opinion, which emotion or emotions do you think should be included in the "Emotion Tracker" in the future?**

Long answer text

**Did you enjoy tracking your emotions? \***

Yes

No

**Did the "Emotion Tracker" tool assist you in tracking your emotional experiences while designing?**

Yes

No

**Did you find the "Emotion Tracker" helpful? \***

Yes

No

After section 3 Continue to next section

**Section 4 of 7**

Section title (optional)

Description (optional)

**How did the "Emotion Tracker" help you? \***

Long answer text

After section 4 Go to section 6 (Design Process Related Emotions)

**Section 6 of 7**

Section title (optional)

Description (optional)

**Why you didn't find the "Emotion Tracker" helpful? \***

Long answer text

**Do you have any suggestions to improve the "Emotion Tracker" tool in the future? \***

Long answer text

After section 5 Continue to next section

**Section 6 of 7**

#### Design Process Related Emotions

Description (optional)

**In your design experiences, which emotion or emotions used in the "Emotion Tracker" do you believe lack relevance or are unnecessary to include: (You can choose more than one)**

Enjoyment

Relaxation

Anger

Frustration

Boredom

Joy

Hope

Contentment

Relief

Anxiety

Shame

Sadness

Disappointment

After section 6 Continue to next section

**Section 7 of 7**

#### Factors Impact (External & Internal)

Description (optional)

**What external factors (i.e., something you can't control) affect you through your design process (you can choose more than one):**

Social Factors

Cultural Factors

Economic Factors

Technological Factors

Environmental Factors

Political Factors

Other...

**Considering your answer to the previous question, please provide examples for the selected factor:**

Long answer text

**What internal factors (i.e., something you can control) affected you through your design process (you can choose more than one):**

Research Skills

Thinking Skills

Management Skills

Communication Skill

Emotional Regulation Skills

Other...

**Considering the factors you selected in the previous question, please tell us how these internal factors affected you:**

Long answer text

**Throughout the entire duration of your project, could you share a significant moment or occurrence that influenced your emotions, whether in a positive or negative way?**

Long answer text

## Semester Two

**Section 1 of 9**

### FBS\_Emoational Experiences of Design Students Study\_One Year Tracking\_Phase 2\_2024

B I U

This feedback represents questions related to the emotion tracking tool and study conducted as a part of research aimed at fulfilling the requirements for a PhD degree in Design and Emotion.

Researcher: Hazar Taiseer Eid Maraj  
Email: hazar.taiseer.eid.maraj@strath.ac.uk

After section 1 Continue to next section

---

**Section 2 of 9**

#### Participants Information

Description (optional)

**Student Name \***

Long answer text

**Gender \***

Short answer text

**Age \***

Short answer text

**Study Year Level \***

3rd Year student  
 4th Year student  
 5th Year Student  
 6th Year student

**University Name \***

German Jordanian University  
 University of Strathclyde

After section 2 Continue to next section

---

**Section 3 of 9**

#### Tool Usability and Reliability

Description (optional)

**When did you use the "Emotion Tracker"?**

Only Semester One  
 Only Semester Two  
 Both Semesters

**Did using the "Emotion Tracker" influence your awareness of your emotional state during the design process?**

Yes  
 No

**Describe how effective the "Emotion Tracker" tool was in helping you monitor and understand your emotions throughout the design process.**

Long answer text

**What challenges or limitations did you encounter while using the "Emotion Tracker" tool?**

Long answer text

**Did you find the addition of the "Other" option to the "Emotion Tracker" helpful for expressing additional emotions?**

Yes  
 No

**Did you leave any place not filled with emotion?**

Yes  
 No

After section 3 Continue to next section

---

**Section 4 of 9**

#### Why

Description (optional)

**Please explain why you left it empty.**

Long answer text

After section 4 Continue to next section

**Section 5 of 9**

#### Design Process Related Emotions

Description (optional)

**Do you think the emotions listed in the "Emotion Tracker" are enough to express your emotional experience(s) while designing?**

Yes  
 No

**On a scale of 1 to 5, how well does the "Emotion Tracker" tool capture the nuances of your emotional experiences during the design project?**

1. 1 = Very Low  
2. 2 = Low  
3. 3 = Medium  
4. 4 = High  
5. 5 = Very High

**From your perspective, what other emotion do you believe is important to list in future versions of the "Emotion Tracker"?**

Long answer text

**In your design experiences, which emotion or emotions used in the "Emotion Tracker" do you believe lack relevance or are unnecessary to include: (You can choose more than one)**

Enjoyment  
 Relaxation  
 Anger  
 Frustration  
 Boredom  
 Joy  
 Hope  
 Contentment  
 Relief  
 Anxiety  
 Shame  
 Sadness  
 Disappointment  
 None  
 Other...

**What is the most emotionally challenging/difficult stage in the design process you encounter during your final design project? (You can choose more than one)**

Brief and specification  
 Research (Opportunity Identification)  
 Concept Design  
 Design Development  
 Detail Design  
 Production  
 Other...

After section 5 Continue to next section

---

**Section 6 of 9**

#### Factors Impacts

Description (optional)

**What external factors (i.e., something you can't control) affect you through your design process (you can choose more than one):**

Social Factors  
 Cultural Factors  
 Economic Factors  
 Technological Factors  
 Environmental Factors  
 Political Factors  
 Other...

**Considering your answer to the previous question, please provide examples for the selected factor:**

Long answer text

**Section 6 of 9**

#### What internal factors (i.e., something you can control) affected you through your design process (you can choose more than one):

Research Skills  
 Thinking Skills  
 Making Skill  
 Management Skills  
 Communication Skill  
 Emotional Regulation Skills  
 Other...

**Considering the factors you selected in the previous question, please tell us how these internal factors affected you:**

Long answer text

**Could you share a significant moment or occurrence throughout the duration of your project that influenced your emotions during the whole period of your project, whether positively or negatively?**

Long answer text

After section 6 Continue to next section

---

**Section 7 of 9**

#### Emotional State

Description (optional)

**Did you encounter a state of "Emotionlessness" during your project and its process?**

Yes  
 No

**As a designer and based on your experiences, how do you interpret the concept of "Emotionlessness"?**

Long answer text

**Which of the following options closely aligns with your interpretation of "Emotionlessness"? (You can choose more than one)**

Emptiness  
 Nothingness  
 Neutrality  
 Numbness  
 Other...

After section 7 Continue to next section

---

**Section 8 of 9**

#### Future Study

Description (optional)

**Would you like to participate in a focused group interview for future studies under the same research? (The interview will be scheduled based on your availability)**

Yes  
 No

After section 8 Continue to next section

---

**Section 9 of 9**

#### Future Correspondence

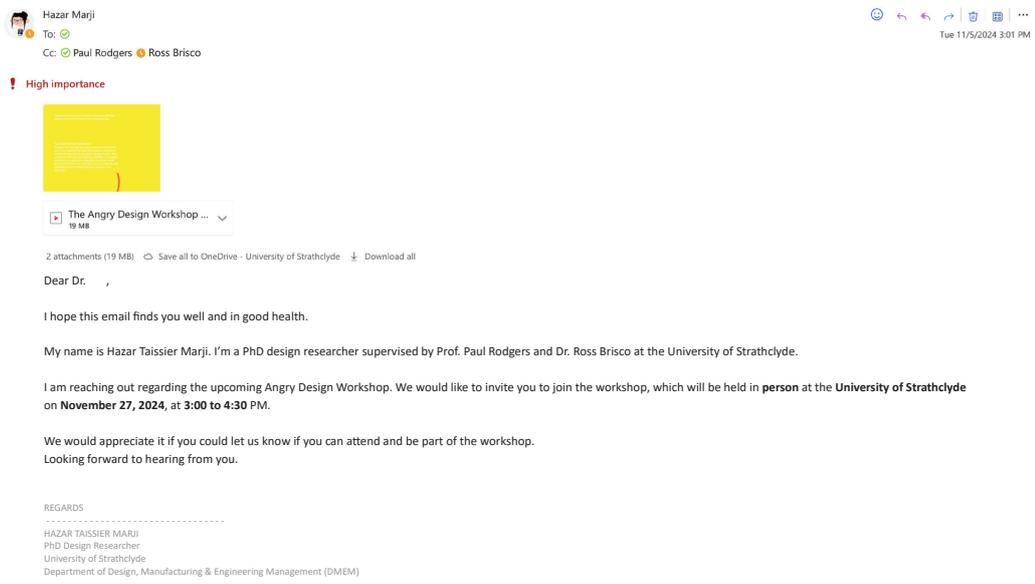
Description (optional)

**Thank you for your ongoing interest in participating in my research. Kindly provide a valid contact email address for future correspondence.**

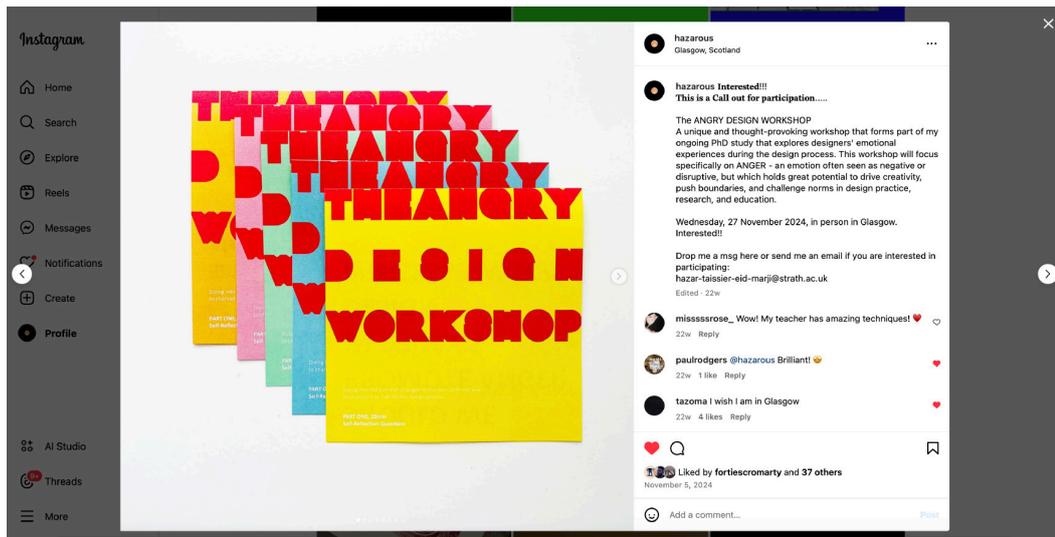
Long answer text

# Appendix 11. The Angry Design Workshop: Advertisements and Invitations

## Email Invitation



## Social Media Advertising (Instagram)



Poster and Cards



# THE ANGRY DESIGN WORKSHOP

Diving into the concept of anger to discover different ways to channel it as fuel for the design process.

**The ANGRY DESIGN WORKSHOP**  
A unique and thought-provoking workshop that forms part of an ongoing PhD study that explores designers' emotional experiences during the design process. This workshop will focus specifically on ANGER - an emotion often seen as negative or disruptive but which holds great potential to drive creativity, push boundaries, and challenge norms in design practice, research, and education.

IN-PERSON WORKSHOP

**When/Wednesday, 27<sup>th</sup> November 2024 at 3:00 - 4:30 pm**  
**Where/ James Weir Building, JW707, University of Strathclyde, Glasgow**

If you're interested in participating, please send an email to [hazan-taissier-aid-marj@strath.ac.uk](mailto:hazan-taissier-aid-marj@strath.ac.uk)

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If you're interested in participating, please send an email to [hazan-taissier-aid-marj@strath.ac.uk](mailto:hazan-taissier-aid-marj@strath.ac.uk)

## Appendix 12. The Angry Design Workshop: Planning

| Original Version   | RB Feedback   | PR FEEDBACK  |
|--|---|--|
| Do you think design students of today need more angry emotion within the design process? WHY?                                | Do you think design students of today need more angry emotion within the design process?why? Should we include anger in design education?       | Should we promote anger among design students of today? Why? Should we <b>promote</b> anger in the design process? Why?  |
| Can you do a reflective on your own experience while you work within the design process?                                     | Can you do a reflective on your own experience while you work within the design process?  | ----   |
| What role does anger play in reflecting students frustrations in the design processes?                                       | What role does anger play in reflecting students frustrations in the design processes?  | What role does anger play in reflecting students frustrations in the design processes?   |
| How can educators create a safe space for students to explore and express anger productively?                                | if we are going to introduce anger.... flip How can educators create a safe space for students to explore and express anger productively?       | If we are going to promote anger within design education how can we create a safe space for students to explore and express anger productively?  |
| How can you incorporate anger into your teaching methods?  | How can you incorporate anger into your teaching methods?<br><b>being angry at the teacher or the process?</b><br><b>anger in oneself?.....</b> | How can you incorporate/imagine anger into your teaching methods, is it: <ul style="list-style-type: none"> <li>• being angry at the teacher?</li> <li>• beng angry on the the process?</li> <li>• being angry anger in oneself?</li> <li>• <b>beng angry of the context / issue?</b></li> <li>• other.....</li> </ul> |
| In your experience, have you encountered situations where anger has led to creative breakthroughs? Can you share an example? | In your experience, have you encountered situations where anger has led to creative breakthroughs? Can you share an example?                    | In your experience, have you encountered situations where anger has led to creative breakthroughs? Can you share an example?   |
| How anger can fuel the design process?   | ---   | How can we change the perception of anger?   |
| -----  |   | <p>How can we use anger to help early submitters to slow down, avoid rushing through the process, and encourage more methodical thinking?</p> <p>How can we use anger to help late submitters (last-minute) to motivate them to work harder and encourage more structure planning?</p>                                 |

**THE ANGRY DESIGN WORKSHOP**  
Dipping into the anger emotion notion to find the perfect way to fuel the design process.

### Modified Workshop Questions

#### Introduction, 5min

#### Part one 20min (4min each question + -)

##### Self-Reflection Questions

1. Should we promote anger in the design process of today? Why?
2. How can we change the perception of anger among students?
3. If we are going to promote anger within design education how can we create a safe space for students to explore and express anger productively?
4. How can you incorporate/imagine anger into your design teaching methods? (Give example that illustrate the how)  
Further details: prior research suggests different aspects of anger, including but limited to anger at the tutor, at the process, at oneself, at the context/issue, other ...)
5. In your experience, have you encountered situations where anger has led to creative breakthroughs? Can you share an example?

#### Part two 20 min

##### Discussion Questions

1. What problems or concerns do you have regarding anger?
2. How can anger be a motivator for the design process? or How can anger fuel the design process?

#### Part three, 10 min

##### Change and opinion

1. How has your perception of anger changed after the workshop?

**THE ANGRY DESIGN WORKSHOP**

What...  
Diving into the concept of anger to discover different ways to channel it as fuel for the design process.

When...  
27 November 2024 at 2:00 pm

Where...  
DNEEN, Room to be confirmed

**WORKSHOP STRUCTURE & QUESTIONS**

Workshop Introduction (5min)

**PART ONE, 20min**  
**Self-Reflection Questions**  
(4min each question +-), Card base and no sharing thoughts at this stage.

1. Should we promote anger in today's design process? Why?
2. How can we change the perception of anger?
3. If we are going to promote anger within design education, how can we create a safe space for students to explore and express anger productively?
4. How can you incorporate/imagine anger into your design teaching methods? (Give an example that illustrates that)  
Further details: prior research suggests different aspects of anger, including but limited to anger at the tutor, at the process, at oneself, at the context/issue, other ...)
5. In your experience, have you encountered situations where anger has led to creative breakthroughs? Can you share an example?

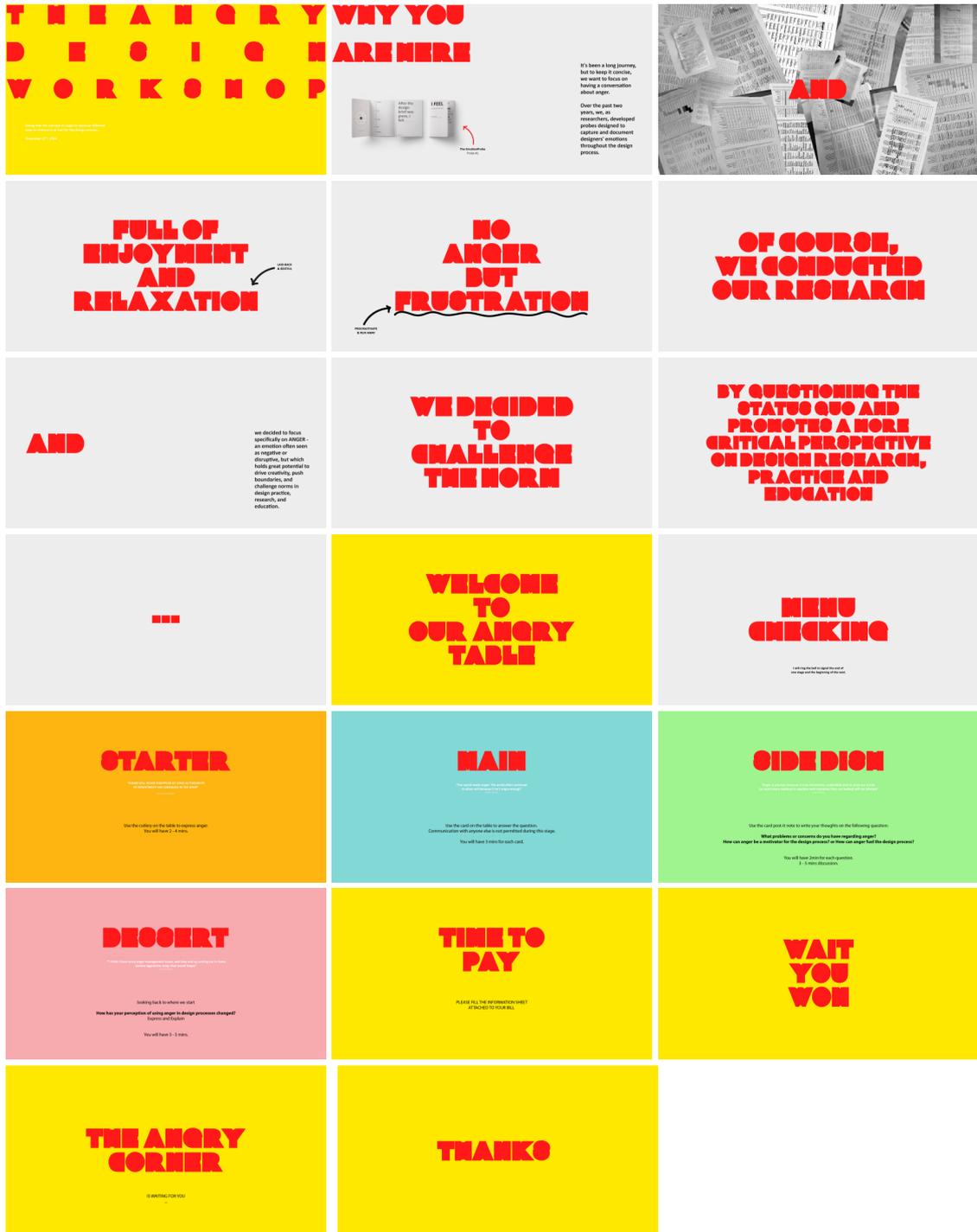
**PART TWO, 20min**  
**Discussion Questions**  
(10min each question +-), Open discussion

1. What problems or concerns do you have regarding anger?
2. How can anger be a motivator for the design process? or **How** can anger fuel the design process?

**PART THREE, 10 min**  
**Change in Perception**  
(10min +-), Open discussion

1. How has your perception of anger changed after the workshop?

# Appendix 13. The Angry Design Workshop: Presentation Slides



## Appendix 14. Ethics: Research Information Sheet and Consent Forms



### Participant Information Sheet: Emotional Experiences of Design Students Study

**Name of department: Design Manufacture and Engineering Management**

**Title of the study: Is Design Delightful? An Examination of Design Students' Emotions when Designing**

#### Introduction

This research is being conducted as part of research towards the fulfilment of a PhD degree. The researcher: Hazar Taissier Eid Marji, PhD candidate within the Design Manufacture and Engineering Management (DMEM) department at Strathclyde University. Email: Hazar-Taissier-Eid-Marji@strath.ac.uk

#### What is the purpose of this investigation?

*The purpose of this investigation is to:*

- Investigate the emotional experience involved within the design process through a project base.
- This research will significantly enhance the personal and professional growth of upcoming designers, particularly in shaping their design processes and emotions during their design journey.

#### Do you have to take part?

*Participation in the experiment is completely optional (voluntary). You are under no obligation to take part in the research, and you have the freedom to withdraw from the experiment at any point, whether before or during the data collection sessions.*

#### What will you do in the project?

*You will be requested to document your emotional experiences throughout the duration of your design project, utilising a specially designed tool tailored for this research's objectives. At the conclusion of the experiment, on the final day of the study, you may be invited to provide insights and reflections on your experience.*

#### Why have you been invited to take part?

*You have been invited to take part in this study because you have at least 1 year of formal design education.*

#### What are the potential risks to you in taking part?

*The researcher and departmental ethics committee have determined that there are no risks involved in participating in this study.*

#### What information is being collected?

*You will be asked to provide your name and some basic demographic information (name, email, gender, age, study year level). In addition, information is being collected based on the tool administered.*

#### What happens to the information in the project and for how long?

*Information will be anonymised, remain entirely confidential, and only accessible by the primary researcher. All collected data will be stored in accordance with Strathclyde University's data management requirements. The contact information data will be stored for a minimum of 7 years.*

Thank you for reading this information – please ask any questions if you are unsure about what is written here.

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**What happens next?**

*If you are happy to be involved in the experiment, you will be asked to sign a consent form confirming this.  
If you do not wish to be involved in the experiment then nothing further is required, thank you for your time and attention.*

**Researcher contact details:**

Hazar Taissier Eid Marji  
PhD Student at DMEM  
Hazar-Taissier-Eid-Marji@strath.ac.uk  
Tel: +44 7494 733367  
James Weir Building, WJ608  
Glasgow, G11XJ, UK.

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Department of Design Manufacture and Engineering Management  
University of Strathclyde  
75 Montrose Street  
Level 7, James Weir Building  
Glasgow, G11XJ, UK.

If you have any questions/concerns, during or after the investigation, or wish to contact an independent person to whom any questions may be directed or further information may be sought from, please contact:

Secretary to the University Ethics Committee  
Research & Knowledge Exchange Services  
University of Strathclyde  
Graham Hills Building  
50 George Street  
Glasgow  
G1 1QE

Telephone: 0141 548 3707  
Email: ethics@strath.ac.uk

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## Consent Form for Emotional Experiences of Design Students Study

**Name of department: Design, Manufacture and Engineering Management**

**Title of the study: An Examination of Design Students' Emotions when Designing**

- I confirm that I have read and understood the information sheet for the above project and the researcher has answered any queries to my satisfaction.
- I confirm that I read and understood the privacy Notice for Participants in Research Project and understand how my personal information will be used and what will happen to it (i.e., how it will be stored and for how long).
- I understand that my participation is voluntary and that I am free to withdraw from the project at any time, up to the point of completion, without having to give a reason and without any consequences.
- I understand that any information collected in the study will remain confidential and no information that identifies me will be made publicly available.
- I understand that photos will be captured as part of the study tool's usage and will be incorporated into the research.
- I consent to being a participant in the project.
- I understand that anonymised data (i.e. .data which do not identify me personally) cannot be withdrawn once they have been included in the study, and that it will be kept by the University of Strathclyde.
- I understand that anonymised data I produce during the study may be viewed and rated by researchers at the University of Strathclyde for research purposes.
- I consent to my contact information being kept for the duration of 7 years.

|                           |       |
|---------------------------|-------|
| (NAME)                    |       |
| Signature of Participant: | Date: |

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## Consent Form for "The Angry Design Workshop"

**Name of department: Design Manufacture and Engineering Management**

**Title of the study: Is Design Delightful? An Examination of Designers' Emotions when Designing**

- I confirm that I have read and understood the information sheet for the above workshop, and the researcher has answered any queries to my satisfaction.
- I confirm that I read and understood the privacy *Notice for Participants in Research* Project and how the information will be used and what will happen to it (i.e., how it will be stored and for how long).
- I understand that my participation is voluntary and that I am free to withdraw from the workshop at any time, up to the point of completion, without giving a reason or without any consequences.
- I understand that any information collected in the study will remain confidential and no information identifying me will be publicly available.
- I understand that photos will be captured as part of the workshop, incorporated into the research, and published on different platforms.
- I consent to being a participant in the workshop.
- I understand that anonymised data (i.e., data that do not identify me personally) cannot be withdrawn once they have been included in the study and that the University of Strathclyde will keep them.
- I understand that the anonymised data I produce during the workshop may be viewed and rated by researchers at the University of Strathclyde for research purposes.
- I consent to my contact information being kept for the duration of 7 years.
- I consent to having my response recorded as part of the workshop if needed.
- I consent the voice record will be deleted after the interview is transcribed.

(Participant Name)

Signature of Participant:

Date:

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# Appendix 15. Ethics: Icon License Certificates

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Appendix 16. Enlarged and High-Resolution Figures

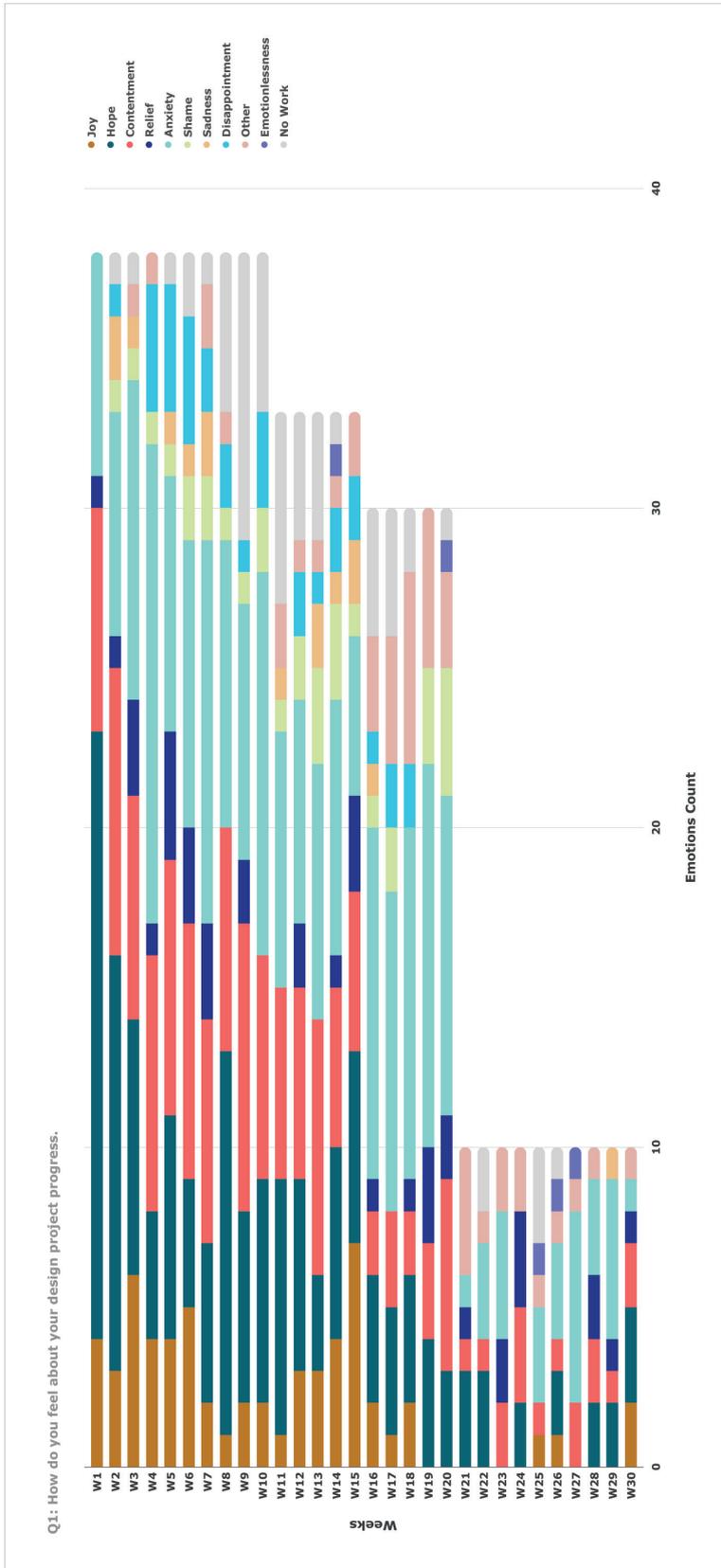


Figure 4-29. Weekly Emotional Responses to Reflective Question One Over a 30-Week Design Project Timeline.



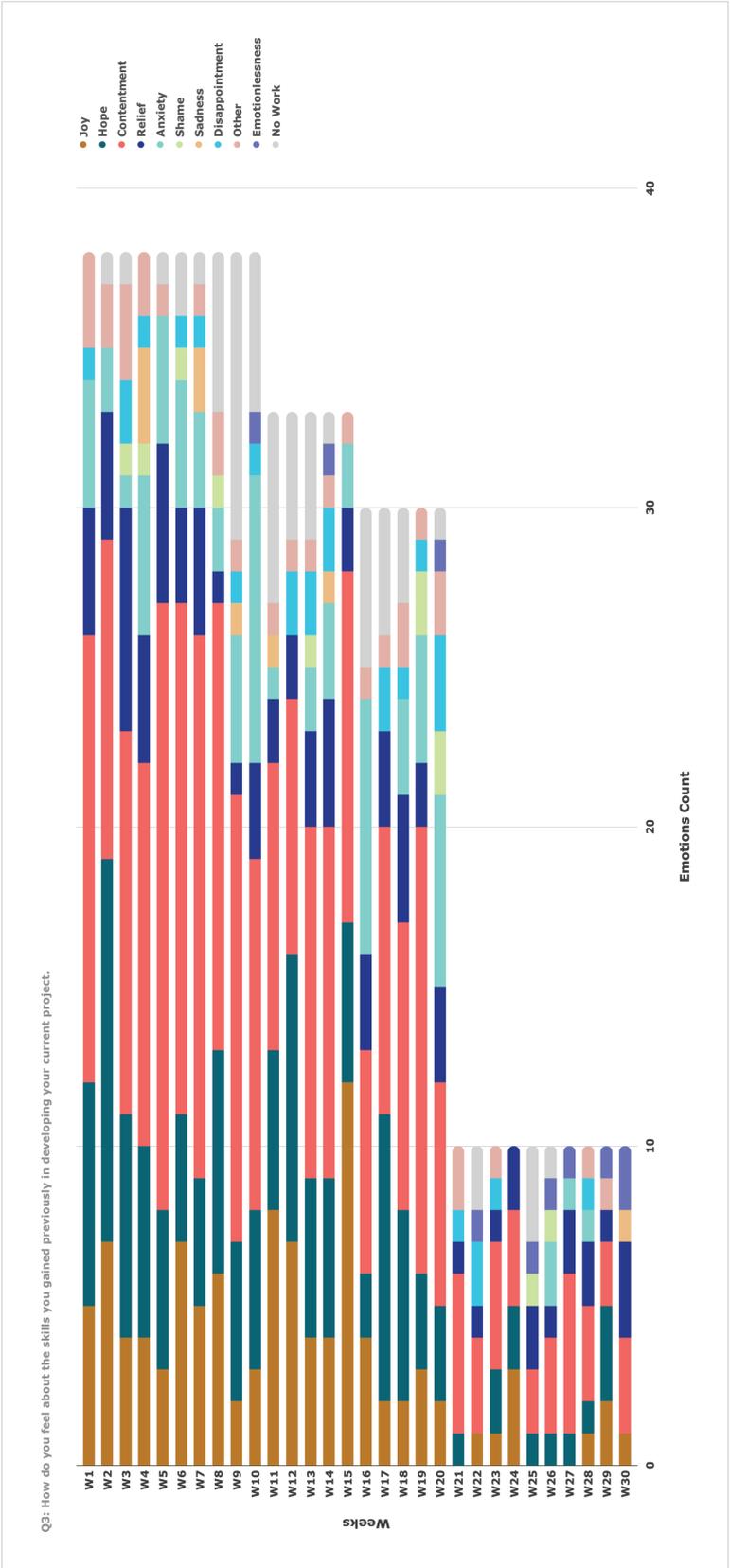


Figure 4-31. Weekly Emotional Responses to Reflective Question Three Over a 30-Week Design Project Timeline.

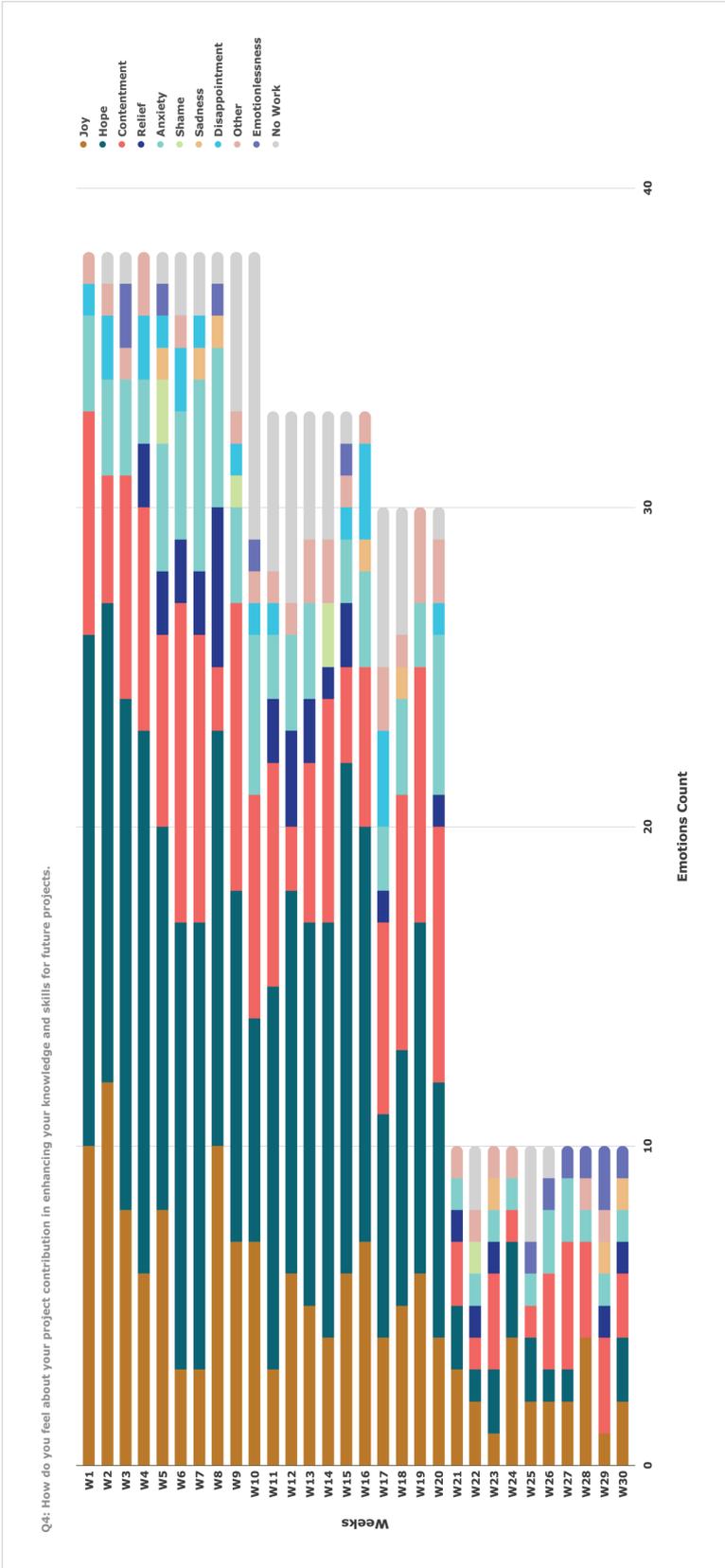


Figure 4-32. Weekly Emotional Responses to Reflective Question Four Over a 30-Week Design Project Timeline.

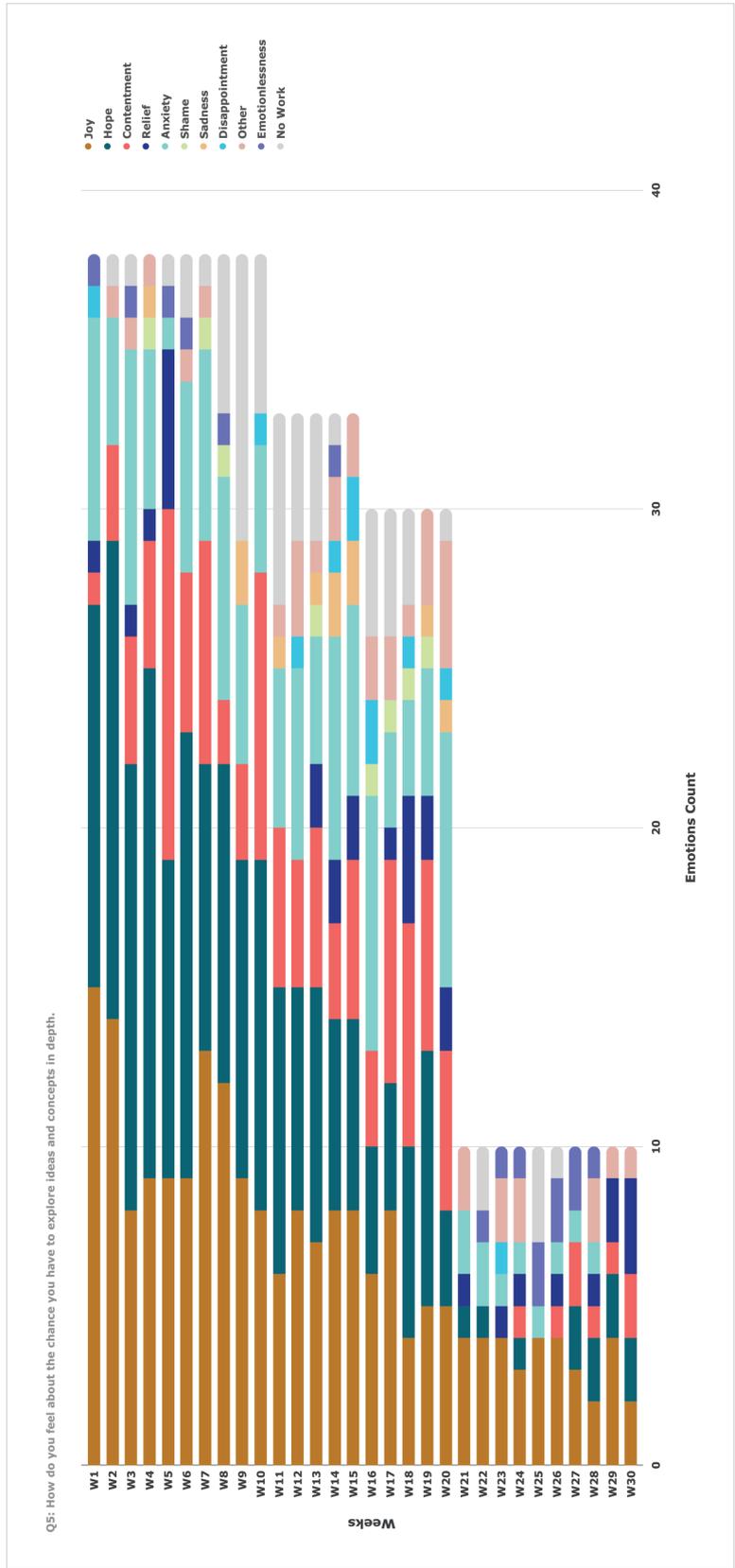


Figure 4-33. Weekly Emotional Responses to Reflective Question Five Over a 30-Week Design Project Timeline.

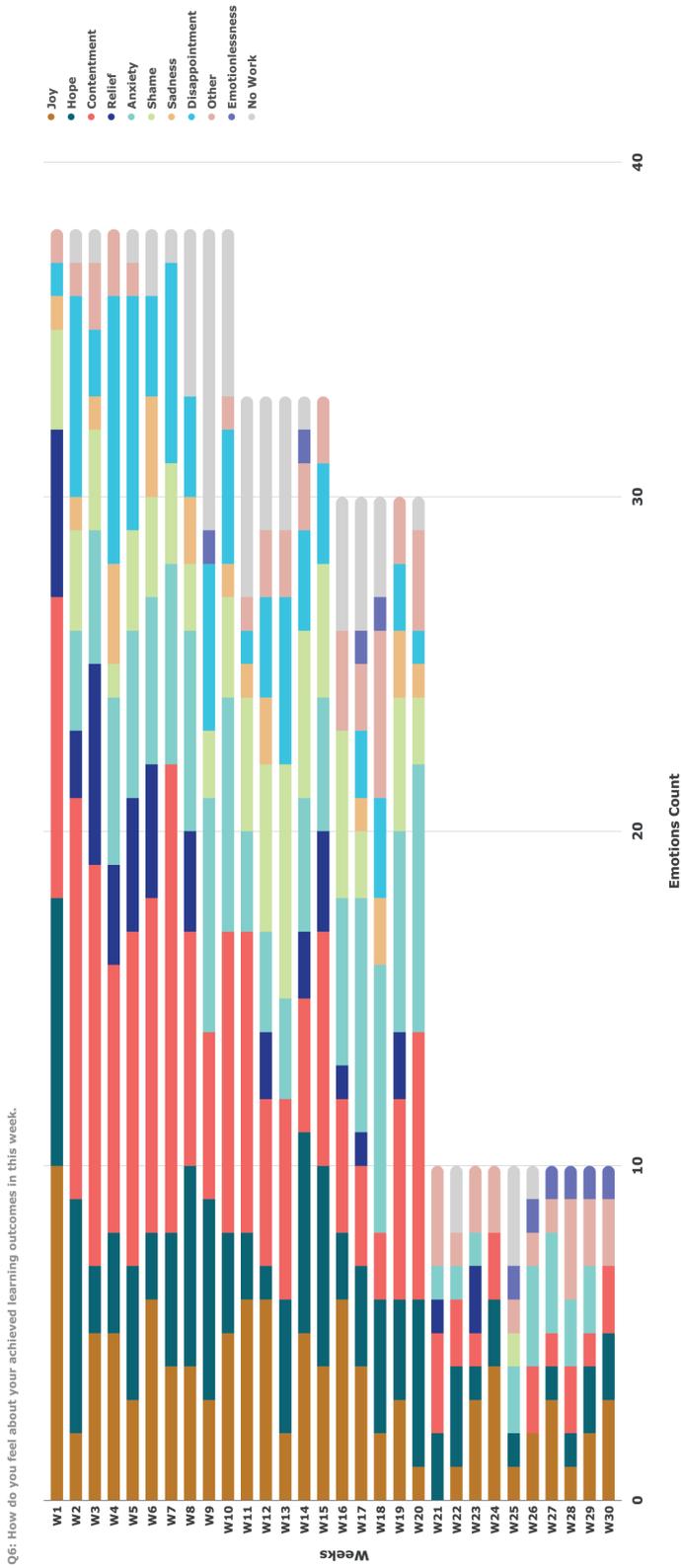


Figure 4-34. Weekly Emotional Responses to Reflective Question Six Over a 30-Week Design Project Timeline.

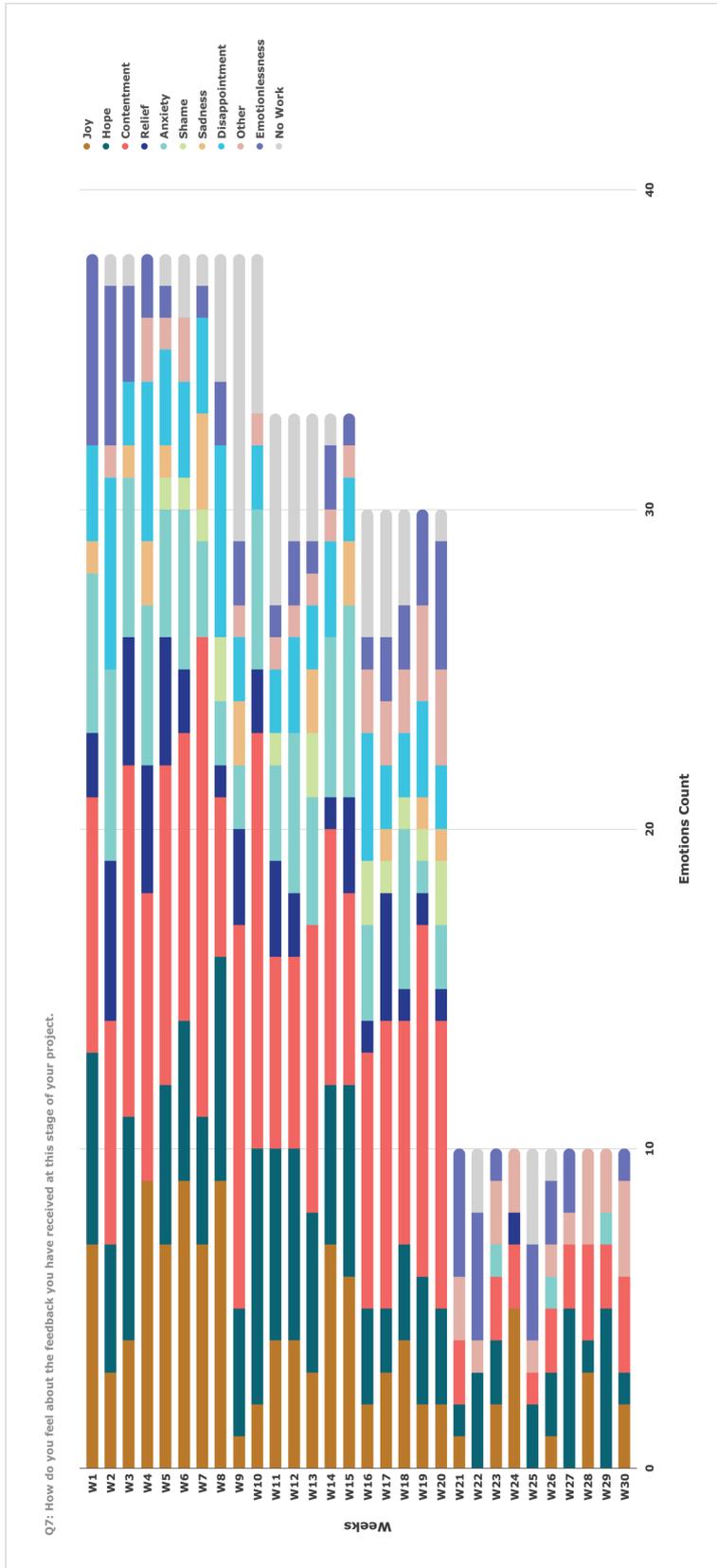
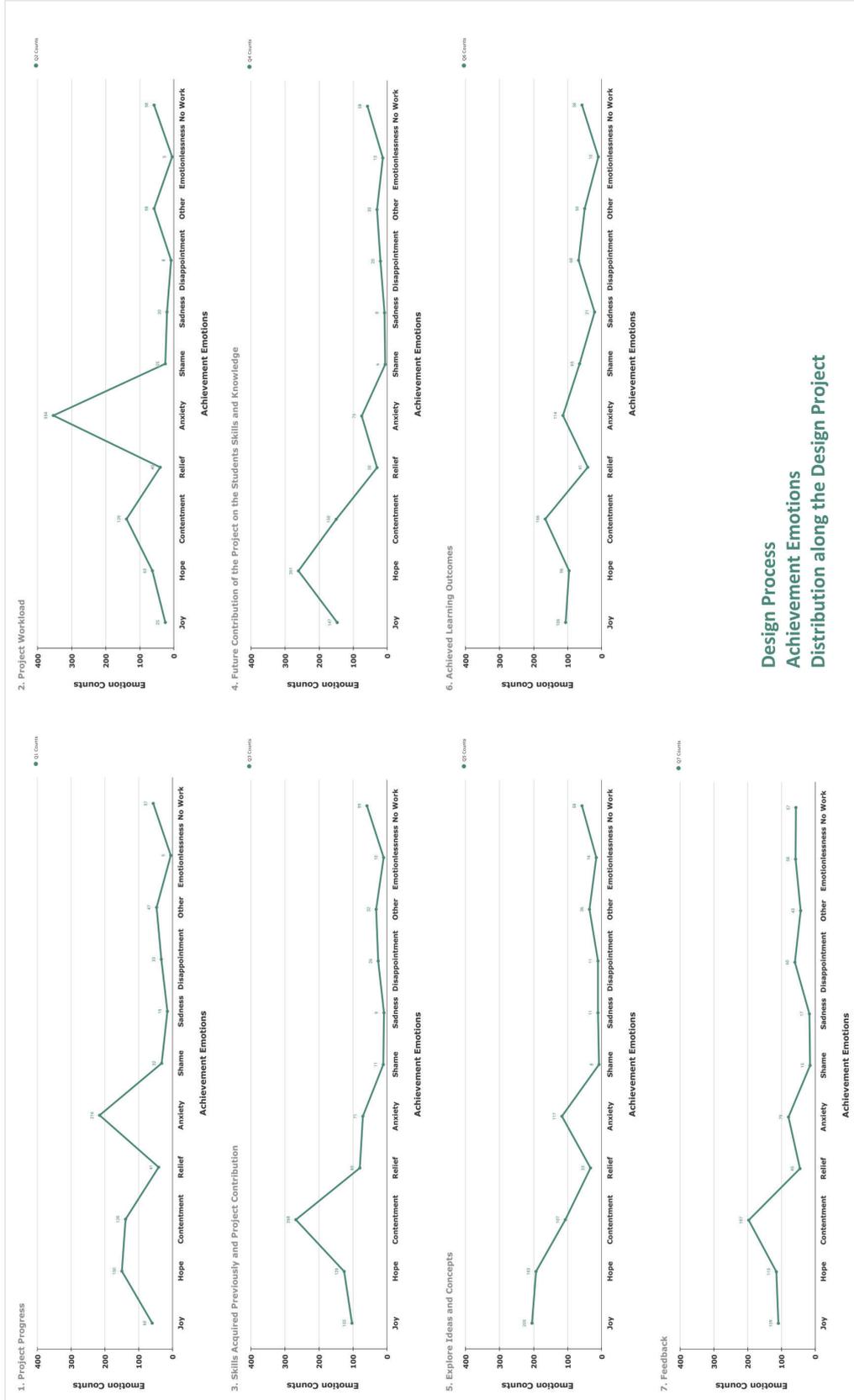


Figure 4-35 Weekly Emotional Responses to Reflective Question Seven Over a 30-Week Design Project Timeline.



**Design Process Achievement Emotions Distribution along the Design Project**

Figure 4-36. Design Process Achievement Emotions Distribution along the Design Project.

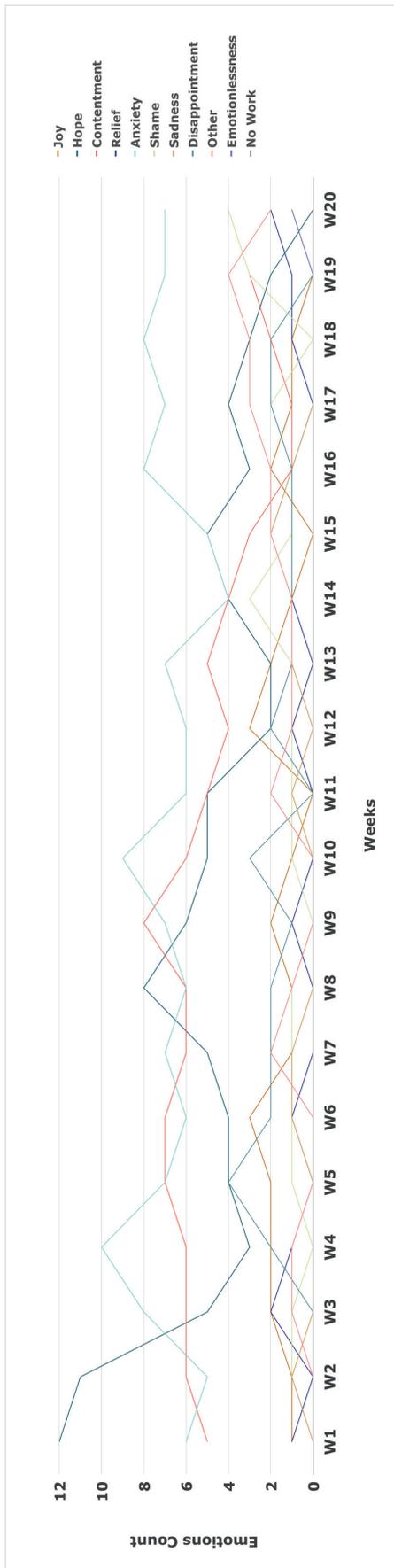


Figure 4-39. Achievement Emotions Distribution during weeks, Scottish Design Students.

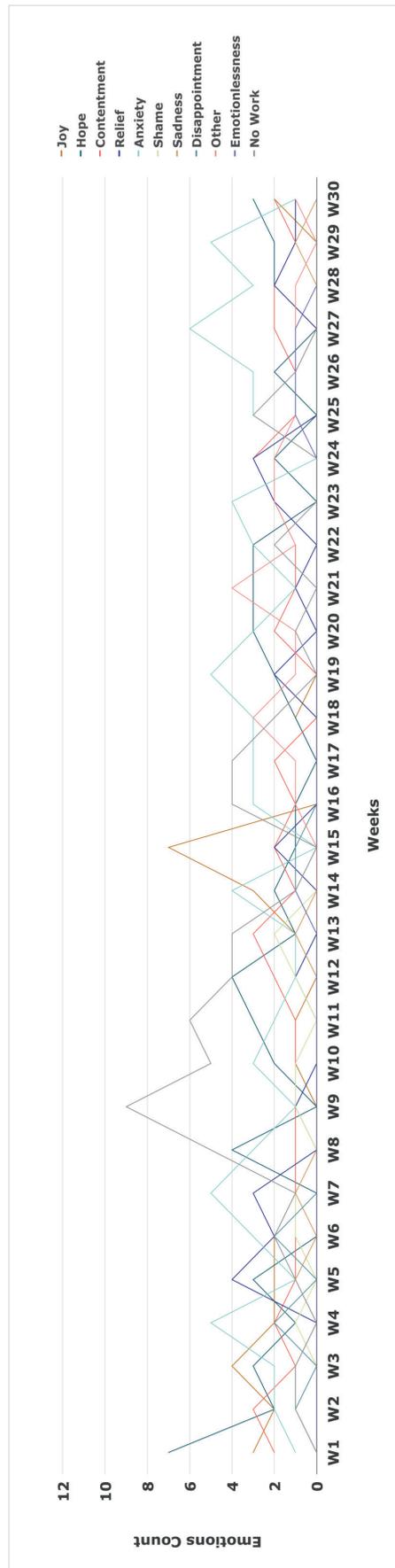
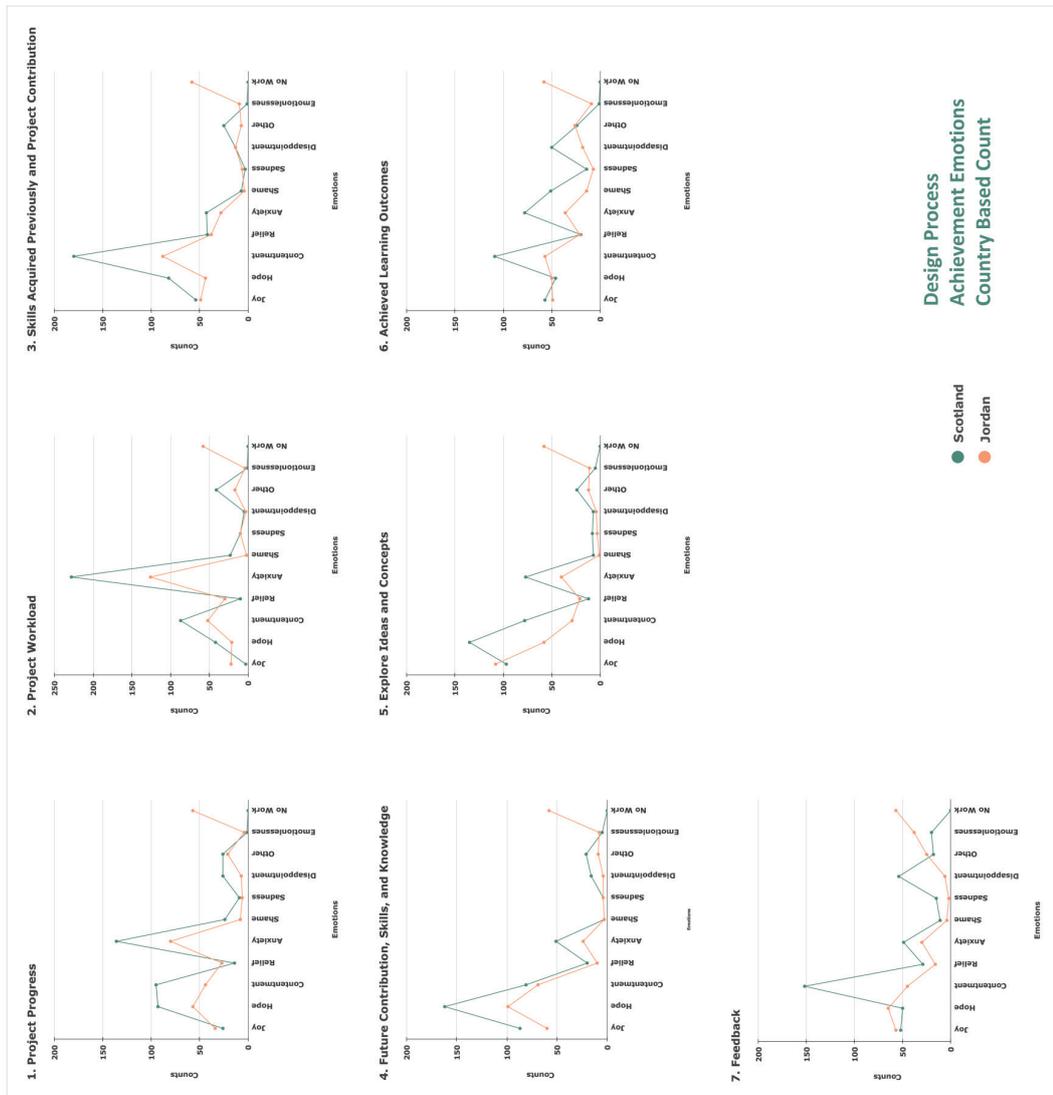


Figure 4-40. Achievement Emotions Distribution during weeks, Jordanian Design Students.

Figure 4-41. Design Process Achievement Emotions Country-Based Count.



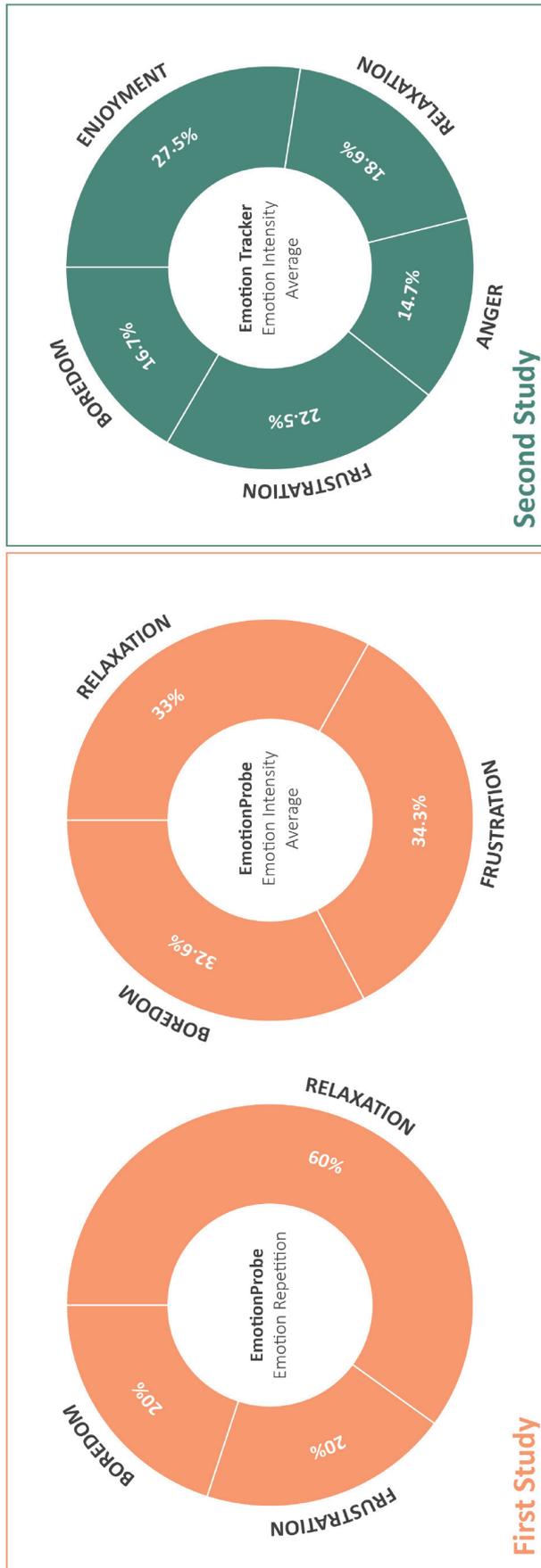
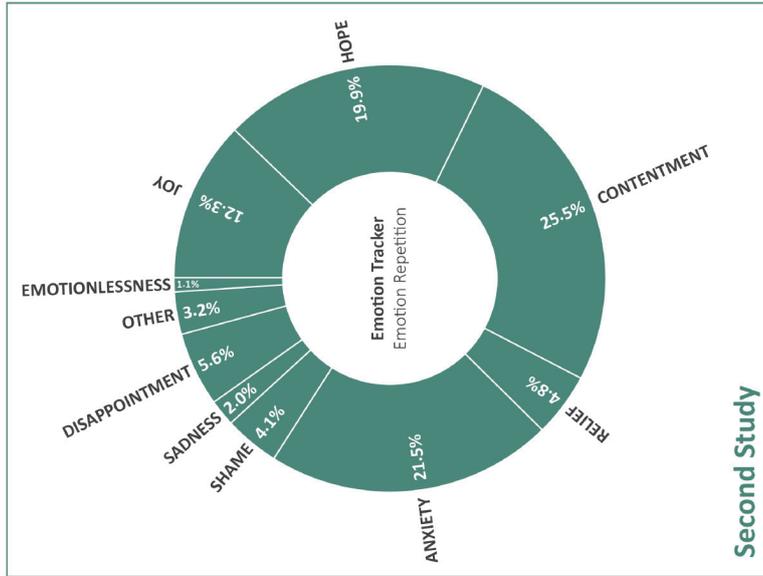
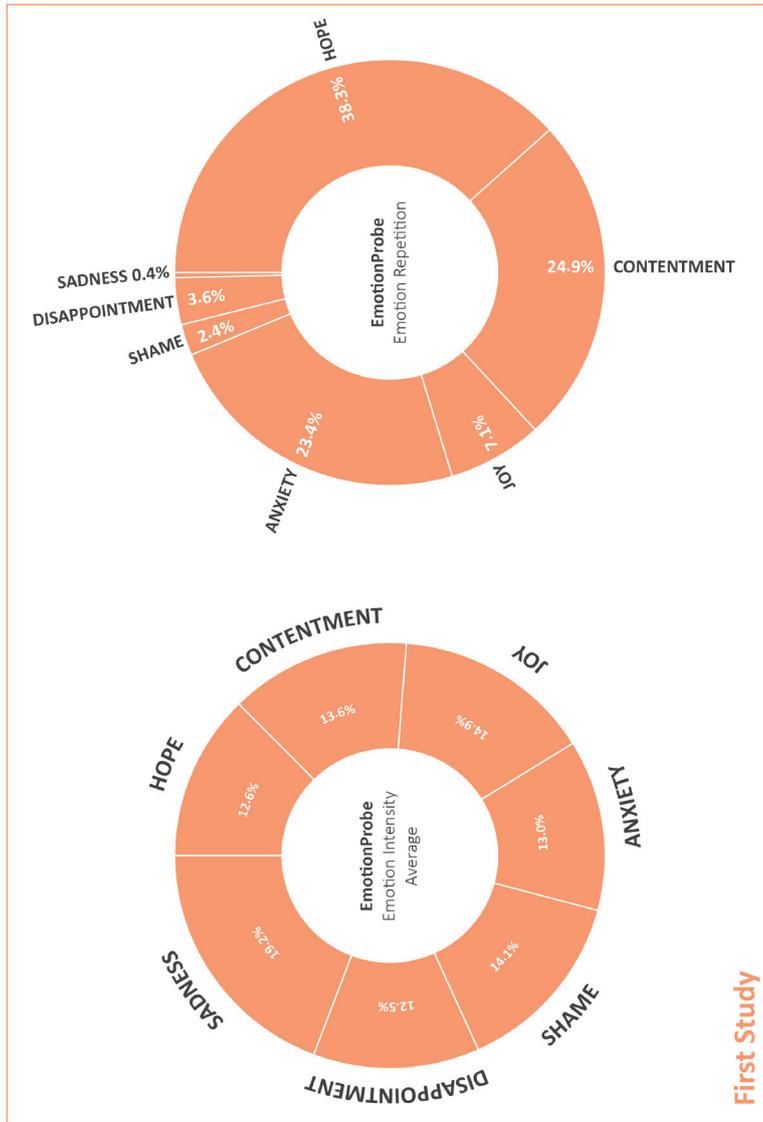


Figure 5-1. Design Students' Experiences of Activity Emotion During the Design Process. Research Exploratory Studies: Left, Study One; Right, Study Two.



Second Study



First Study

Figure 5-2. Design Students' Achievement Emotion Experiences During the Design Process. Research Exploratory Studies: Left, Study One; Right, Study Two.













● IT IS NORMAL

● TO FEEL ...



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