Feelings Toolkit:
A New Evaluation Tool for Very Young Children

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Declaration

This thesis is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination which has led to the award of a degree.

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I thank all my friends who helped me in so many ways. There are too many names to be written here. I pray to Allah that all of you will be blessed forever. No words can describe my feelings for you, dear friends.

My deepest thanks are to my family; my parents, my husband and my kids, and all the family members for supporting me and making dua' all the time. I love you all.

For, believers are those who, when Allah is mentioned, feel a tremor in their hearts, and when they hear His signs rehearsed, find their faith strengthened, and put (all) their trust in their Lord.

Al Anfal: 9: 2

Abstract

The Feelings Toolkit is a new evaluation tool developed for very young children aged 3 to 5 years old. The tool can be used to evaluate feelings after very young children interact with computer products. It has two versions: the *Wafiy* Feelings Toolkit and *Alisya* Feelings Toolkit. It uses photographic representation and bipolar adjectives, *good* versus *bad*. The photographs were modelled by two nursery-aged children, one boy and one girl, representing one positive feeling *(good),* one neutral feeling, and one negative feeling *(bad).*

It is difficult to find a suitable tool or method to evaluate feelings after very young children interact with computer products. But it is crucial to involve very young children in evaluating children's computer products since they are the users. Many researchers have developed tools and methods for older children aged above five.

The Feelings Toolkit was developed using an iterative design approach and children's participation in the UK. The development process involved six stages; design and testing of (1) Smiley Feelings Toolkit, (2) Pictorial Feelings Toolkit, (3) *Wafiy* Feelings Toolkit, and (4) *Alisya* Feelings Toolkit. Then (5) exploratory sessions were conducted to learn about children's reactions to using the tool. Finally, (6) the tool was validated with older children in Malaysia. The final Feelings Toolkit was produced and was evaluated by very young children in kindergarten and at home.

The Feelings Toolkit is an efficacious tool to be used with computer and non-computer products. It can be used by parents at home, children's product designers and developers in the office or school, technology manufacturers in the factory, child psychologists in the clinic or school, and children's trainers or facilitators in the camp or school. The tool can be utilized by teachers during teaching and learning activities too. It is recommended to use the Feelings Toolkit as an addition to interviews and observation, not as a replacement.

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CHAPTER 1

INTRODUCTION

1.1 Research Motivation

Nowadays young children live, learn and play with computer technology at home, in school, and everywhere. As early as 3 years old, children are exposed to computer technology by their parents, teachers, society, and the media.

Children can be an important source of information for developers to create enjoyable and usable computer products. Since these products are created by adults, it is very important to get young children's views and involvement to enable developers to understand and create enjoyable and usable products for young children.

Many researchers (Druin, 2002; Read and MacFarlane, 2006; Read, 2015) have tried to involve children in different development stages, for example in design and evaluation. However, this PhD research only explores children's participation in an evaluation stage. There is still a gap in young children's evaluation methodology, even though some researchers in the Child–Computer Interaction community have been focusing and publishing on that subject (Zaman et al., 2009).

The several methods for evaluating children's products include survey methods, verbalisation (Think Aloud), Fun Toolkit, Structured Expert Evaluation Method (SEEM), This-or-That pairwise comparison method, and Problem Identification Picture Cards (PIPC).

However, it is difficult to find a suitable tool for evaluating computer products from the perspective of very young children aged 3 to 5 years old. Furthermore, conducting evaluation with very young children is particularly challenging due to their lack of reading ability and of reasoning ability about emotions, and their limited vocabulary (Mohd-Yusoff et al., 2010). Recently, some tools have been developed for older children aged 5 and above. For example, the Fun Toolkit is for children aged 5 to 10 (see Section 2.7.2) and PIPC is for children aged 5 to 7 (see Section 2.7.1).

Evaluating young children's feelings, particularly regarding fun, after they interact with a computer product is very challenging. This is due to young children's still limited mental and physical abilities. Some researchers may think they are too young and incapable of being involved in evaluating computer products. But issues like usability and fun are very important to understand from young children's point of view.

Fun is an important component in the success of a product and the ability to evaluate fun has become crucial to the development of age-appropriate computer products (Mohd-Yusoff et al., 2011). A well-known researcher in Human–Computer Interaction (HCI), Ben Shneiderman, states that design for fun is associated with design for children (Shneiderman, 2004). Read and MacFarlane (2000) highlight that children, play, and fun are related; fun is something that children know about and are expert in. As children experience fun, they can talk about it, describing it as excitement, play, laughter, and feeling good.

Therefore, the researcher believes it is crucial to develop an evaluation tool for very young children to elicit their feelings after interacting with computer products. Thus this research aims to develop a new evaluation tool that can be used to evaluate feelings after very young children interact with computer products.

1.2 Research Background

This research aims to develop a new evaluation tool for very young children. The research questions, objectives, and research outcomes were identified as follows:

1.2.1 Research Questions

The objectives were translated into the three following research questions (RQs). The relation between the research questions and the objectives is shown in Figure 1.1:

RQ1: What is a suitable evaluation tool to be used to evaluate feelings after very young children interact with computer products?
RQ2: How can we evaluate the efficacy of the new evaluation tool?
RQ3: What are the experiences of working with young children?

1.2.2 Objectives

Two main objectives (obj) were identified to be achieved in this project:

Obj1: To develop a new evaluation tool that can be used with and by very young children by using an iterative design approach and children's participation.

Obj2: To evaluate the efficacy of the new evaluation tool when used by very young children in kindergarten and children at home.

To answer the research questions and to achieve the main objectives, three main activities were conducted in three different phases: (1) reviewing the literature and conducting a preliminary study at two different places, i.e. a nursery and primary school in the initial phase; (2) developing a new evaluation tool using an iterative design approach and children's participation in the development phase; and (3) evaluating the new evaluation tool with very young children in the evaluation phase. All the objectives were achieved in this research and the research outcomes are presented in related chapters in this thesis.

1.2.2 Research Outcomes

The research outcomes are presented in four chapters. Conducting a preliminary study to choose a suitable place and a suitable age-group of children to conduct this research with is described in chapter 3. The development of a new evaluation tool using an iterative design approach and children's participation was achieved and presented in chapter 4. Conducting exploratory sessions to learn about very young children's reactions to using the Feelings Toolkit in the nursery and in home environments in the United Kingdom (UK) was achieved and is explained in chapter 4. Conducting a validation study to validate the Feelings Toolkit with older children in kindergarten and in home environments in Malaysia was achieved and is explained in chapter 4. Conducting a user study to evaluate the efficacy of the Feelings Toolkit with very young children in kindergarten and in home environments in Malaysia was achieved and is explained in chapter 5. Finally, experiences of working with young children are discussed in chapter 6. Figure 1.1 shows the relationship between the objectives, research questions, and research outcomes.

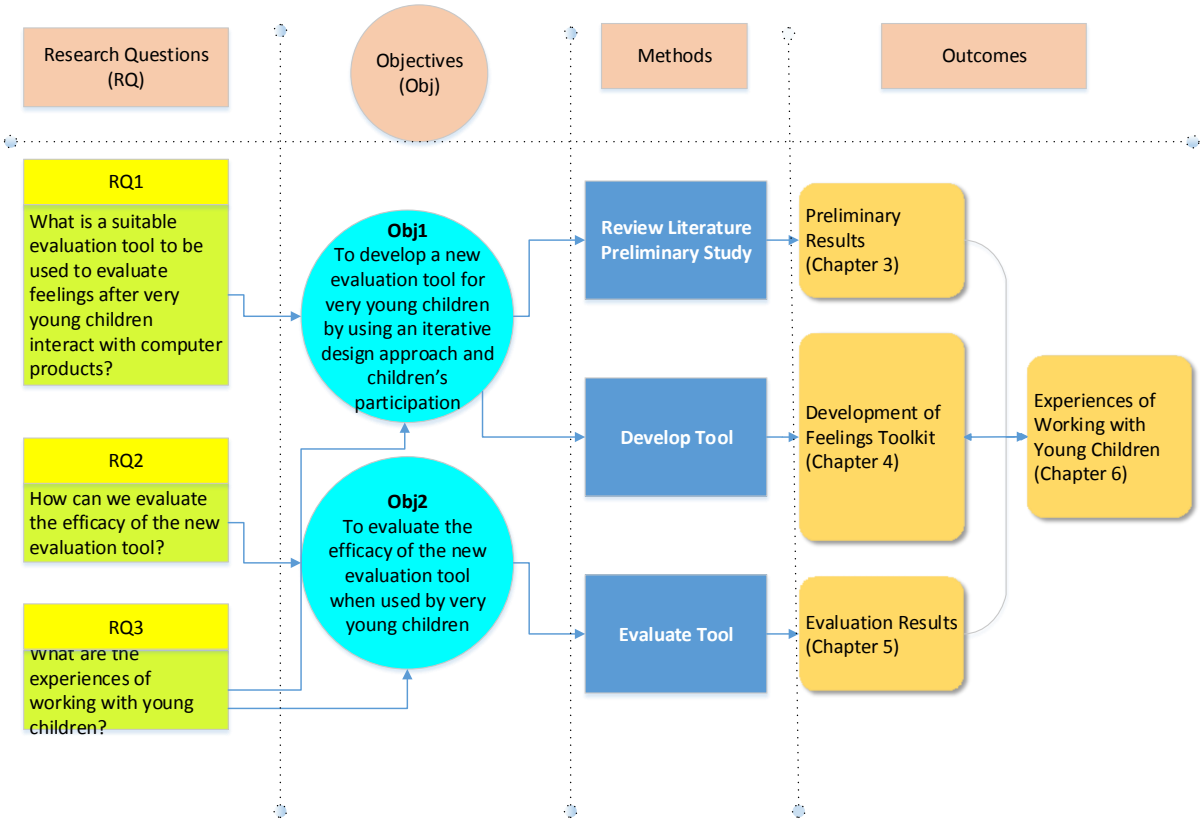


Figure 1.1: Relationship between research questions, objectives, methods, and outcomes

1.3 Research Contributions

This research contributes to the body of knowledge and to the CCI community. Details of the contributions are highlighted in Chapter 7 (see Section 7.5).

1.4 Thesis Structure

The overall structure of the research consists of seven chapters including this introductory chapter.

Chapter 2 presents a review of related literature. Some of the topics discussed in this chapter are: Child–Computer Interaction (CCI), children and technology, how children recognise emotions in faces, children's tools/scales using pictures and animation, adult tools using pictures and animation, and children's evaluation methods in CCI.

Chapter 3 describes the methodology applied in this research which is categorised under three phases: initial, development, and evaluation. In the initial phase, the researcher reviewed related

literature and conducted a preliminary study in two different environments: at a nursery and at a primary school. In the development phase, the researcher developed a new evaluation tool, called the Feelings Toolkit, with young children's participation using the iterative design approach. In the evaluation phase, the researcher evaluated the efficacy of the evaluation tool.

Chapter 4 explains in detail the development of a new evaluation tool, the Feelings Toolkit from the Smiley Feelings Toolkit, Pictorial Feelings Toolkit, *Wafiy* Feelings Toolkit, and *Alisya* Feelings Toolkit. The development used the iterative design approach, which iterates the design–test–redesign of the tool until the final version of the Feelings Toolkit successfully became stable. The researcher conducted exploratory sessions in the UK, which aimed (1) to observe how nursery children use the Feelings Toolkit with a computer and non-computer products and (2) to observe how children in the home environment use the Feelings Toolkit versions (*Wafiy* and *Alisya*) compared to the Smiley-adapted-to-Feelings Toolkit. The researcher conducted further studies to better validate the tool in Malaysia with older children.

Chapter 5 highlights the user studies conducted to evaluate the efficacy of the Feelings Toolkit with very young children in Malaysia in two environments, in a kindergarten and at home.

Chapter 6 discusses the experiences of working with young children in the research. The discussion starts with child development issues, which cover cultural issues and children's ages. Then, it discusses the challenges of working with very young children, which cover stakeholder (adults) participation, children's participation, nursery activities, bureaucracy and procedural, ill health, and weather. The discussion moves to methodological problems, which cover assigning adult roles, the platform – the CBeebies website interface and content, the venue of study, duration of study, and procedures to organize the children's turns. Next, strategies to work with very young children are also discussed. Finally, suggestions to conduct the user study with very young children are discussed in two aspects, a flexible study plan and correct attitudes.

Chapter 7 summarises the general conclusions derived from this research.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature that contributes to this research. It covers: Child–Computer Interaction (CCI), Child–Computer Interaction (CCI) vs. Human–Computer Interaction (HCI), User Experience (UX) background, fun and "funology", children and technology, children's cognitive development, children's development and products, children's participation - The Ladder of Participation, how children recognise emotions in faces, children's tools/instruments using pictures and animation, adult tools using pictures and animation, and finally children's evaluation methods in CCI.

2.2 Child–Computer Interaction (CCI)

Child–Computer Interaction (CCI) is a research area focusing on creating new technologies for children. The CCI community has covered methodological issues of how to engage children in the design process since the first International Interaction Design and Children (IDC) conference in 2002. The IDC conference is ACM sponsored, and started from a workshop at Eindhoven University, followed by a conference held at the University of Central Lancashire, UK in 2003, and a conference at the University of Maryland, US in 2004. Europe and the United States alternately host the IDC conference annually (Read et al., 2011). This year, 2018 Trondheim, Norway will host the 17th IDC Conference.

Read (2015) highlighted that the CCI community has a history of advancing children as active participants in research, design, and evaluation. The CCI community defines children as aged from 3 to 16 years old. However, most of the work in CCI focuses on children between 5 and 11 years old. Very few studies concern children under 3 and between 16 and 18 years old (Read and Bekker, 2011). The authors tried to understand the field of CCI. They believe these two terms, CCI and IDC are often, but not always, used interchangeably. Besides, some people may articulate CCI as associated with theory and IDC as associated with design.

Read and Bekker (2011) proposed a new definition of CCI, where the nature of CCI is considered to be:

> "a study of the Activities, Behaviours, Concerns and Abilities of Children as they interact with computer technologies, often with the intervention of others (mainly adults) in situations that they partially (but generally do not fully) control and regulate."

They analysed the field of CCI starting from a historical look at this field, and identifying some of the important consequences in its development, reflection of working experience, and knowledge from the literature, to describe and explain the nature of CCI. The authors highlight the key differences between CCI and Human–Computer Interaction (HCI). In addition, they explore similarities and differences affecting the methods and approaches needed for research and practice in CCI.

Read and Markopoulos (2013) usefully summarised the state of Child–Computer Interaction, tracing the first scientific studies of children's use of technology up to the future direction of this area. The authors also forecast challenges, concerns, and themes for the CCI community in the future. This will enable CCI researchers to discover where they can most usefully contribute to this interesting and promising research area. Their invaluable insights on the CCI road map will attract other potential researchers to join this CCI area.

Other researchers in the CCI community proposed future work based on their own research areas. For example, Smith et al. (2013) proposed a new direction in CCI towards an ecological inquiry. Ecological inquiry has some epistemological similarities with existing methodologies such as Cooperative Inquiry and Participatory Design. Antle (2013) identified opportunities for future research in embodied child–computer interaction.

In the next section, Child–Computer Interaction (CCI) and Human–Computer Interaction (HCI) are mapped to better understand the relation.

2.2.1 Child–Computer Interaction (CCI) versus Human–Computer Interaction (HCI)

Markopoulos, Read, et al. (2008) reported that Child–Computer Interaction (CCI) is still finding its way compared to Human–Computer Interaction (HCI). It is the sub-field of HCI that studies how children use interactive products.

Based on the ACM SIGCHI curriculum, HCI is concerned with five components/sections: nature, context, computer, development, and human. The nature of HCI is mapped to its essential components. It is demonstrated in five sections. The top section is the nature (N) of HCI. The four supporting sections are listed below (Read and Bekker, 2011):

- the use and context of computers (U)
- computer system and interface architecture (C)
- the development process (D)
- the human characteristics (H)

In CCI, nature refers to three aspects named as ABC (Activities, Behaviours, and Concerns) by Read (2005). The use and context of computers in HCI refers to Activities in CCI. The computer system and interface as architecture in HCI refers to Behaviour in CCI. The development process in HCI refers to Concern in CCI. Finally, the human characteristics in HCI refer to children's abilities. The abilities of children were not focused on by Read (2005).

How can we map this research in CCI to HCI? The nature of this research conforms to the definition of CCI (see Section 2.2) and is mapped to the above HCI components. Children perform activities, i.e. play computer games from a children's website and edutainment courseware in a nursery and at home. Computer technology, i.e. a desktop with a well-designed interface, is used, to match the children's behaviour. A new evaluation tool is developed in an iterative process concerned with children's participation. Finally, children's cognitive abilities to understand and use the tool were considered in the development process.

In the next section, the background of user experience is reviewed so that it can be connected with this CCI research.

2.2.2 User Experience (UX) Background

Tullis and Albert (2013) state that user experience consists of three characteristics: a user, the user interacting with a product, system, or anything with an interface, and the user's experience that is measureable. The authors highlight a few important questions in UX; why is it important to measure UX? How can we measure UX? What metrics can be used to measure or evaluate UX? How do UX metrics differ from other types of metrics?

The authors believe that UX metrics will become a critical part of a product development process that aims to provide an efficient, easy to use, and engaging technology as products become more complex and are created to be used by diverse users. UX metrics are based on a reliable measurement system and all UX metrics must be observable and quantifiable. UX metrics differ from other metrics because they disclose something about human experience using a product or system in terms of the aspects of effectiveness, efficiency, or satisfaction. Besides, UX metrics measure something about people and their attitudes. Thus, UX metrics can answer these vital questions:

Will the user recommend the product?
Is this new product more efficient to use than the current product?
How does the user experience of this product compare to the competition?
Do the users feel good about the product or themselves after using it?
What are the most significant usability problems with this product?
Are improvements being made from one design iteration to the next?

Hassenzahl and Tractinsky (2006) defined UX with a broad variety of meanings ranging from traditional usability to beauty, hedonic, affective or experiential aspects of technology use. Law et al. (2009) reported from a survey of academicians and practitioners that UX is dynamic, context-dependent, and subjective. The authors defined UX as something individual (instead of social) that emerges from interacting with a product, system, service or object.

In the latest studies, Alhussayen et al. (2015) evaluated the user experience (UX) of children interacting with an educational and entertainment website. Alrashed and Alhussayen (2015) examined the user experience (UX) of children's interaction with Arabic interfaces in educational learning contexts. Vissers et al. (2013) reported on the MemoLine instrument to evaluate long-term UX with children. Sim et al. (2012) reported on evaluating game preference using the Fun Toolkit in the UK and Jordan.

In this research, the researcher evaluated children's experience after interacting with computer products; does the user feel good about the product after using it? Thus, the researcher developed an evaluation tool known as the Feelings Toolkit. The tool aimed to evaluate very young children's feelings after interacting with a computer product. The researcher believes that evaluating fun is crucial when dealing with children's interaction with computer products. How does the researcher define fun?

2.2.3 Fun and "Funology"

In general, fun is doing activities that are enjoyable and amusing. According to Dorman (2000), fun consists of elements of humour, chuckles, delight, ecstasy, gags, gaiety, happiness, jests, jokes, joy, laughter, merriment, mirth, play, pleasantries, quips, and witticisms, etc. Read and MacFarlane (2000) defined fun as something that children know about: they are experts. They experience it so they can talk about it, describing it as excitement, play, laughter, and feeling good.

Carroll (2004) described fun as follows: 'Things are fun when they attract, capture, and hold our attention by provoking new or unusual perceptions, arousing emotions in contexts that typically arouse none, or arousing emotions not typically aroused in a given context. Things are fun when they surprise us; when they don't feel like they look, when they don't sound like they feel. Things are fun when they present challenges or puzzles to us as we try to make sense and construct interpretations, when they transparently suggest what can be done, provide guidance in the doing, and then instantaneous and adequate feedback and task closure'. He suggests that fun should be included as a separate usability area because fun is not the same as satisfaction.

MacFarlane et al. (2005) also agreed that fun is not the same as satisfaction in the definition of usability by ISO 9241-11. Satisfaction is about progress towards goals but fun is not goal-oriented. Shneiderman (2004) stated that designing for fun is associated with designing for children. Now more people are noticing the importance of fun as one of the critical success factors in determining the usability of children's application software. But Yatim (2008) claimed there are no specific guidelines to measure the effectiveness, efficiency, and satisfaction or fun in any game-authoring tool or similar. According to Blythe et al. (2004), this is the beginning of the science of enjoyable technology known as "funology".

Nowadays, practitioners and researchers are seriously concerned about how much fun a new technology is. Research in this area is crucial because people like designers and evaluators need to understand "funology" and have guidelines to produce children's computer products such as entertainment websites, educational software, games and edutainment websites. These products should be fun and usable from children's perspectives.

The theme of children and technology is reviewed in the next section.

2.3 Children and Technology

Since November 2000 almost 20 percent of all digital media users were children and the internet is now a part of child's natural environment (Demner, 2001). Children now have access to the internet at school and/or at home. Stephen et al. (2008) defined information and communication technology (ICT) as about not only desktop computers, laptops and peripherals but also interactive television, digital cameras, video cameras, DVDs, mobile telephones, games consoles, electronic keyboards and toys that simulate 'real technology', such as toy laptops or barcode readers. So children and technology are closely related because the technology has an impact on the way the children live and learn with all these ICT gadgets.

For children, playing is the most enjoyable of activities and it is nowadays greatly associated with technology. Markopoulos and Bekker (2003) mentioned that children mostly play and learn while interacting with technology. They use computer products such as entertainment websites at home, in school, or elsewhere to get information, education and entertainment. Monk et al. (2002) highlighted that fun and enjoyment are becoming a major issue as ICT moves from the office to the home. Wiberg (2005) described entertainment websites (EWS) as having features like:

1. *Entertainment information* – information about the theme of the website, jokes etc.
2. *Downloadable items* – screensavers, pictures etc.
3. *Small 'stand-alone' games* – 'Memory' or suchlike.
4. *Other features dependent on plug-in technology* – Re-mixing of music etc.
5. *High quality graphic design*
6. *Edutainment content*
7. *Communication with others* – chat, virtual meeting rooms etc.

Research on children and technology has become crucial in the last few years. Druin et al. (1999) and Markopoulos and Bekker (2002) have started paying attention to children as technology users. They focused their research on understanding children's roles in developing new technologies. For example, Druin et al. (1999) stated that children can be involved in many roles such as user, tester, informant or design partner in developing new technologies. Markopoulos and Bekker (2003) also discussed children's involvement in the design process

based on a model introduced by Druin (2002), but they concentrated more on the usability testing method, with children participating as testers.

The main reason why children should be involved in the software development process is that children's computer products are developed for them. Scott (2000) argued that the best people to give information on the child's perspectives, actions and attitudes are children themselves. They can give honest responses if questioned about events that are meaningful to their lives. Guha et al. (2004) stated that usually children are not involved in the design process until the end, even though there are many roles that children can play in the design of new technology. They believed that children should be involved as equal stakeholders throughout the design process.

It was proven that children have their own needs and preferences on computer products that are different from those of adults. Therefore, it is important to understand how to involve children in the product/system development life cycle. But of course there are challenges working with children, especially when working with children of different age groups. For example, a technique that might work for a 13-year-old would not work or would need to be modified for 4-year-old children (Guha et al., 2004). Many problems need to be solved when the respondents are children, including problems of language use, literacy and different stages of cognitive development (Scott, 2000).

Many researchers have conducted evaluations involving children as evaluators and using different types of evaluation techniques. Previous works have involved children as evaluators to examine, in particular, the usability of computer products (Donker and Reitsma, 2004; Egloff, 2004; Sim et al., 2006; Yatim, 2008; Zaman, 2005). Children are involved in many ways in evaluation sessions: for example, they are required to perform predefined tasks and answer pre and post questionnaires in a lab.

Read and Markopoulos (2008) mentioned that evaluations with children are increasingly conducted outside labs as interactive technology becomes more mobile. The authors suggested that different methods should be used in different locations. Some methods such as diary studies, think-aloud methods, surveys, and Wizard of Oz techniques have been used with older children. The authors also describe the Fun Toolkit - a survey method to obtain children's opinions on technology. Details of the Fun Toolkit are in Section 2.7.2. Some researchers have used other methods like talk-aloud (adapted from think-aloud) and observation when involving young children as evaluators (Donker and Reitsma, 2004).

Chiasson and Gutwin (2005) presented a catalogue of design principles for children's technology to cater for the designer's need. The catalogue considered children's development theories.

At what age can children be involved in developing new technologies? In the next section, the theory on children's cognitive development is reviewed.

2.3.1 Children's Cognitive Development

This section reviews children's cognitive development theory in terms of four aspects; numeracy, literacy, abstract thinking, and empathy development. In general, cognitive development focuses on children's development in terms of information processing, conceptual resources, perceptual skill, language learning, and other aspects of brain development and cognitive psychology. In short, it is about the emergence of children's thinking skills and understanding skills.

In that regard, Levine and Munsch (2014) describe Piaget's Cognitive Development Theory. They believe that cognitive development is based on genetics (from biology) and epistemology (a philosophical understanding of the nature of knowledge), in which children think in different ways from adults. Children's thinking changes in qualitative ways as they move through the four stages of cognitive development. However, the age range for each stage is an approximation because some children reach the stages sooner or later than others. But the path of children's cognitive development should move in one direction. Table 2.1 shows Piaget's Stages of Cognitive Development.

Table 2.1: Piaget's Stages of Cognitive Development

Stage	Age	Description
Sensorimotor	Birth to 2 years	Infants understand the world through the information they take in through their senses and their actions on it.
Pre-operational	2 to 7 years	Young children do not yet think logically, and their thinking is egocentric.
Concrete operations	7 to 12 years	Children now think logically, but their thinking is concrete, not abstract.
Formal operations	12 years and older	Adolescents can think both logically and abstractly.

In the pre-operational stage (aged 2 to 7), Piaget highlighted that children do not yet have logical thought. The children think magically and egocentrically. They lack operations, which are mental actions that follow systematic and logical rules. However, at this age, children have the ability to use symbols. The major accomplishment of this stage is the ability to represent actions mentally rather than physically. Young children can think about and refer to objects that are not in their surroundings because they can represent the object in their minds. They can tell an adult about something, e.g. a banana they ate yesterday. A symbol is anything that represents something else that is not present, but symbols at this age are still very concrete. However, abstract symbols are not comprehended by the pre-operational child.

According to the Oxford Dictionary, numeracy is defined as the quality or state of being numerate: ability with or knowledge of numbers. Children aged 3 to 4 are still learning to understand quantity. Though they can count up to five, their understanding of what number means is still developing. Children aged 4 to 6 can match the numbers 1 to 10 with ten items. This means they are counting with meaning. They can solve simple problems. Children aged 5 to 7 can count items and match them.

In this research, numbers 1 to 5 were used in the Smiley Feelings Toolkit only. The findings showed that some children can understand the numbers. They circled the numbers to answer questions. Numeracy skill is required in the early version of the Feelings Toolkit only.

In the Oxford Dictionary, children's literacy is defined as the quality, condition, or state of being literate; the ability to read and write. Levine and Munsch (2014) mention a technique known as dialogic reading, which is effective in developing early literacy skills. Using the technique, when an adult and child look at a picture book together, they actively talk about it. The child is engaged in the process when the adult asks questions and encourages a dialogue about what is happening in the story. Usually, children aged 3 or 4 can "read" familiar books by telling stories using the pictures as cues. Besides, the authors state that children understand basic writing skills such as writing moving from left to right (in English-speaking countries), from top to bottom of the page, and that writing is to deliver information. Children love to write their names and they master this skill before they enter school.

In this research, young children are not required to read and write in the Feelings Toolkit. The researcher reads an introductory statement to start engaging the child with the tool. Then, the children are shown photographs in the tool and are asked a question. Reading skill is not required. Writing skill is also not required except in the early designs, the Smiley Feelings Toolkit and Pictorial Feelings Toolkit. Children were given the tools to circle in the Smiley

Feelings Toolkit and to tick in the Pictorial Feelings Toolkit. The findings demonstrated that only a few children were able to write (circle and tick) in the two tools. Writing skill was not required in the final tool.

Abstract thinking is a level of thinking about things that is removed from the facts of the "here and now", and from specific examples of the things or concepts being thought about. Children at age 3 can appreciate an abstract level of understanding if the higher level of meaning comes out of a discussion of the book (while reading) with a more mature adult. At older ages and higher levels of thinking, this same process in more mature thinkers, facilitating higher levels of abstraction than in less mature thinkers, characterizes the process of teaching abstract thinking (Ylvisaker et al., 2006).

In this research, a few abstract concepts of adjectives used in designing the Feelings Toolkit were discarded due to young children's inability to understand the meaning, e.g. *attractive* in the Smiley Feelings Toolkit and *confident-confused* in the Pictorial Feelings Toolkit.

Empathy is sharing the feelings, whether pain or pleasure, of another individual. One form of empathy is experiencing another's feelings, which is the basis for human interaction. In representing emotions, if parents use more words to label and describe emotions, children are more comfortable talking about their feelings (Levine and Munsch, 2014).

In this research, photographs were used to represent feelings after very young children interacted with computer products, i.e. *happy-sad, good-bad, love-hate,* and *excited-bored.* The researcher applied a verbalisation technique (used language) to describe the feelings to the very young children. However, the child is expected to point to related photographs, and no verbalisation is required on their part.

Antle (2013) reviewed a number of works that address Piaget's ages and stages theory. The author believed it was introduced with some care into the HCI community. Guidelines based on children's ages and stages are appealing since they can provide a systematic way to determine age-appropriate design considerations. However, the author argued that issues of the historical, cultural, social, physical, and geographical environment of children have been not thoroughly considered.

Children's development stages and products are reviewed in the next section.

2.3.2 Children's Development and Products

Markopoulos and Bekker (2003) discussed children's development stages and the product characteristics that accommodate each stage. The four stages have been adopted from Reiher and Acuff (1997), who based these stages on a synthesis of cognitive, social, emotional, moral and language development perspectives in the context of marketing to children. The stages were:

- The dependency/exploratory stage (birth – 2 years)
- The emerging-autonomy stage (ages 3 – 7 years)
- The rule/role stage (ages 8 – 12 years)
- Early and late adolescence (ages 13 and up)

At different ages, children need different types of products to suit their physical and mental development. For example, children up to 2 need a simple and safe product that can stimulate learning, has a round shape and supports active exploration. An example of a product for this group is an electronic 'activity centre', which has the form of a tablet, with pictures, buttons and sliders. Normally the product has friendly colours and pictures of fantasy-like characters and animals so that children can be introduced to simple words and sounds, for example to animals, letters, numbers and colours.

In the second stage, children enjoy fantasy and magic, are self-centred and do a lot of parallel play. The children need stimulation, love, and safety, even though they are developing autonomy. Products should be simple, not too abstract, adjusted to the not yet fully developed reasoning skills, with present ideas only, because past and future ideas are still difficult to understand, and a close to home theme.

The authors gave an example of computer games for this group which are often placed in the context of a fantasy world. The children have to search for items that enable them to reach a final goal, such as rescuing somebody and finding a treasure. Along the way, the children get to solve riddles and play games that allow them to practise, for example, basic language, musical and maths skills.

In the third stage, children's interests move from fantasy to reality. They play in pairs and groups, like to compete, develop a sense of logic, reasoning and simple abstractions, a need for

acceptance and success, and are easily influenced by friends instead of parents. Products can be more complex and challenging, varied, and competitive. A science fiction theme becomes more popular because the past and future concepts can now be grasped by this group of children. Examples of current products are laptops or handheld computing devices targeting this age group.

In the last stage, early and late adolescence, children develop their abstract and logical thinking, become more independent of peers and parents, and very focused on identity and sexuality. Therefore, products designed for this group are very similar to products designed for adults.

Can young children be involved in developing new technologies such as computer products? In the next section, the researcher reviewed the Ladder of Participation to further investigate what the roles of children can be.

2.3.3 The Ladder of Participation

In Roger Hart's book, entitled Children's Participation, he highlights the theory and practices of involving young children in community development and environmental care. He designs a diagram known as the Ladder of Children's Participation, explaining how children can take part in adult projects (Figure 2.1). The children's participation is classified into eight levels: (1) manipulation, (2) decoration, (3) tokenism, (4) assigned but informed, (5) consulted and informed, (6) adult-initiated, shared decisions with children, (7) child-initiated and directed, and finally (8) child-initiated, shared decisions with adults.

However, he categorized the first three rungs of the ladder as non-participation that should be avoided. Only levels four to eight are considered as degrees of children's participation. This diagram suggests that children should be given choices to participate in adult's projects at any levels from four to eight. A child might choose to work at different levels on different projects or might be at different phases of the same project. A reason why the manipulation level should be avoided is because adults consciously use children's voices to carry their own message. In the decoration level, children's participation is ambiguous; adults may use children as though they were understanding the children (Hart, 1997).

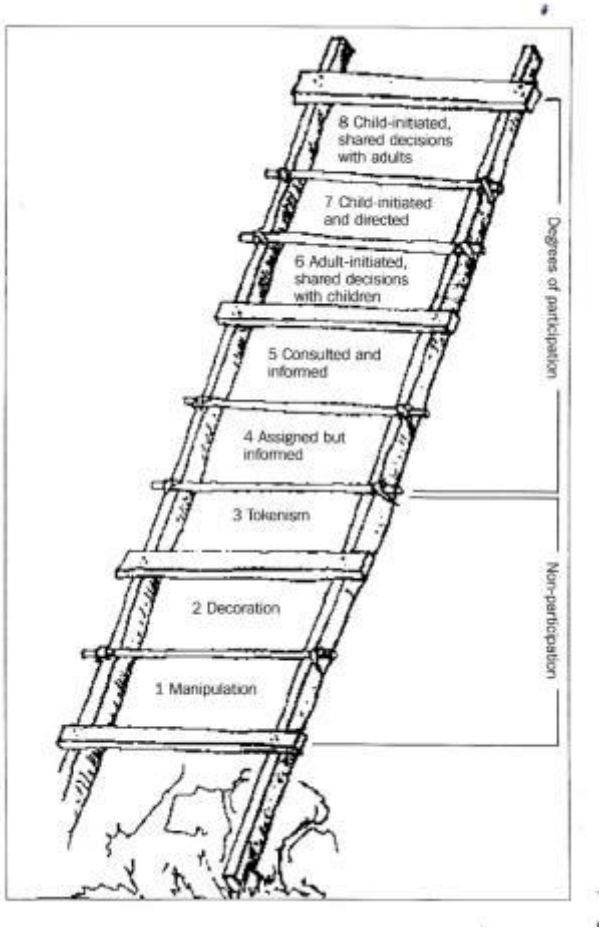


Figure 2.1: The Ladder of Participation

How children recognise emotions in faces is reviewed in the next section.

2.4 How Children Recognise Emotions in Faces

Lyons and Bartneck (2006) highlighted that few works on Human–Computer Interaction have concerned the human face, although the human face plays an important role in many aspects of communication, both verbal and non-verbal. When communicating emotional states to others, humans rely heavily on facial expressions (Pollak and Sinha, 2002).

According to Pollak et al. (2000), recognition of emotion in children is important because it represents the early use of social cues on which children's interpretation and behavioural responses will depend. Generally, nursery children can identify basic emotions from facial and contextual cues. Ellis (1990) reported that small changes to a face between a study and test are

more easily confused by nursery children than by older children, for example, a person wearing a hat and a person not wearing a hat.

Ekman and Friesen (1971) conducted experiments to identify whether facial expressions of emotion are universal. A total of 40 photographs were used of 24 different stimulus persons, male and female, adults and including children. Children aged 6 to 7 were compared with children aged 14 to 15. There were no significant differences in terms of the children's age. Six- to 7-year-olds had the ability to identify the facial expression of emotions cross-culturally.

Many works have been conducted with children in recognising emotion in faces. For instance, in one of the studies conducted by Hicks et al. (2001), they validated a new Faces Pain Scales – Revised (FPS- R) with children aged 5 to 12. In another study, they validated the FPS-R with children aged 4 to 12. The FPS-R is shown to be appropriate for young children from age 4 or 5 onward in assessing children's acute pain intensity.

Children as young as 3 years old were able to recognise facial expressions of emotions in a study conducted by Székely et al. (2011). In the study, they focused on emotional facial expression recognition (FER) in 3-year-old children using verbal and non-verbal computerised tasks for four basic emotions (happiness, sadness, anger and fear). Colour images of the four emotions were presented on a screen and the children responded by using a touch-sensitive monitor.

Widen and Russell (2016) discovered that very young children aged 3 understood the Children's Scales of Pleasure and Arousal (CSPA). The CSPA is a potential instrument to assess children's subjective and descriptive judgements of two dimensions, pleasure and arousal. The very young children used the scales to indicate the level of pleasure and arousal they perceived in stylized faces. They used the pleasure scale to indicate the level of pleasure in photographs of women posing facial expressions and with emotion labels, but they had difficulty in using the arousal scale to indicate the level of arousal in photographs of women posing facial expressions and with emotion labels.

How do children recognise emotion in faces? A recent study by Guarnera et al. (2015) proved that children aged 6 to 7 can recognise basic facial expressions of emotions (anger, happiness, fear, sadness, disgust, and neutral) from the region of the eyes, the mouth, or full face. However, in a study conducted by Golan et al. (2010) with Autism Spectrum Conditions (ASC) children, the findings showed that the ASC children failed to focus on the eyes compared to the mouth.

Tools or instruments using pictures and animation for children are reviewed in the next section.

2.5 Children's Tools/Scales Using Pictures and Animation

Three tools/scales developed for children's use which used different representations are reviewed: Oucher, Soremo, and Visual Analogue Scale (VAS). Oucher uses photographs and numerical rating scales, Soremo uses smiley icons and a traffic light metaphor, and the VAS uses smiley faces and linear scales.

2.5.1 Oucher

The Oucher is a poster-instrument developed for children to help them communicate how much pain or hurt they feel. The Oucher can be used with children aged from 3 to 12 years old. There are two vertical pain scales on the Oucher: (i) a Numerical Rating Scale (NRS) of 0-10 for older children aged 8 to 12 years old and (ii) a colour photographic scale of children's faces with different pain expressions for younger children aged 3 to 7 years (Huguet et al. 2010).

The original Oucher was developed for Caucasian children. But other ethnic versions of the photographic scale have been developed (Beyer et al. 1992). There are currently five versions of the Oucher: (1) White or Caucasian, (2) Black or African-American, (3) Hispanic, (4) First Nations (boy and girl), and Asian (boy and girl). The Oucher requires purchase or costly colour printing. Figure 2.2 shows the Oucher Asian versions; Asian boy (left) and Asian girl (right).

Figure 2.2: Oucher Asian versions (source: www.Oucher.org)

In the next section, Soremo, a non-verbal instrument is also reviewed.

2.5.2 Soremo

According to Girard and Johnson (2009), there is a lack of effective methods to help children to express their emotions in using products of various kinds, particularly software products. Therefore, they developed a method for evaluating how positive or negative the experience of the user was in engaging with the product. A new, non-verbal, self-reporting instrument, known as Soremo, has been developed and pilot studies have been conducted to use the method as part of an assessment of the learning potential of an Open Learner Modelling (OLM) learning tutoring system and to capture the evolution of the children's emotional states while using educational software products. The method aims to be used in educational software products to investigate the relationship between learning and the emotional states.

Soremo measures the children's emotional state and consists of four positive emotions, four negative emotions, and one neutral. The positive emotions are inspired, satisfied, captivated, and happy. The negative emotions are puzzled, bored, disappointed, and angry. The neutral

emotion is thoughtful. These are presented by witch characters with dynamic body and facial expressions, arranged on a black S-shaped board placed on a traffic-light background as shown in Figure 2.3.

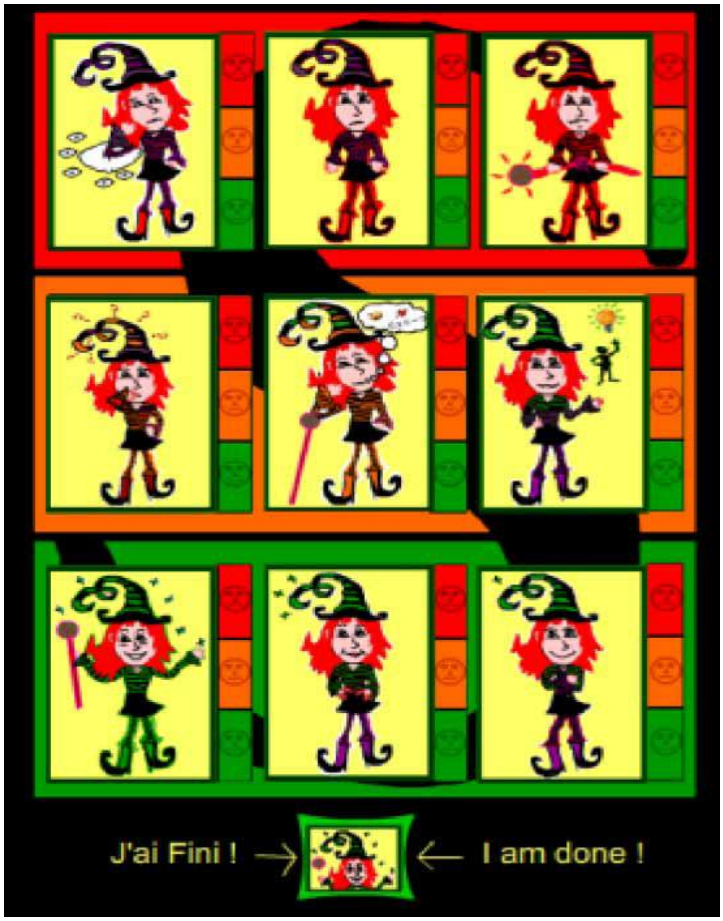


Figure 2.3: The Soremo instrument

The different colours of the traffic light system represent different emotions. Red represents the depth of negative emotion, orange represents a neutral emotion, and green represents the depth of positive emotion. Each of the emotion pictures has a 3-point scale which was decided by children in a participatory design session. The children chose to combine the traffic-light and smiley faces metaphors to express the strength of their emotions.

Using Soremo, the users are asked one question: *'Does this picture represent how I currently feel?'* To answer, 3-point strength scales are used:

- red colour and ☹ for *'This is not how I feel',*
- orange colour 😐 '*I feel a bit like that, but I am not sure',*
- green colour ☺ *'I feel this emotion strongly'.*

Two evaluation sessions were conducted with two groups of children of different ages. English children aged 10 to 11 years old and French children aged 8 to 10 years old participated in the sessions. The main aim was to investigate whether Soremo could be understood by the children. Besides, the researchers wanted to know whether the traffic-light metaphor (using colours) aids the children's understanding, and also to identify any cultural differences between French and English children.

The English children recognised the emotions better than the French children and the accuracy ranged from 76.0% to 94.2%. The positive emotional states were recognised less than the neutral or negative states. The children confused emotional states from the same emotional polarity, for example disappointment and puzzled. Two English children confused some emotional states from the opposite polarity. The results show that colours aid the understanding of emotional states, but one emotional state, unpleasant surprise, was not well recognised with or without colours. The English children first appeared to represent the emotional states and 20% of the 25 English children could consider one emotional state. But the French children had a more equal share of complex and unique views.

Soremo has been evaluated by children aged 8 to 11 years old. It is still new and it is not proven whether it is suitable also or not for younger or older children rather than the mentioned ages. But some of the pictures of emotional states are confusing and complicated to understand for some of the children. The reason might be that Soremo uses iconic representations instead of real pictures. Besides, it is not straightforward. Users have to understand Soremo first before they can use the tool to express their emotions. They have to interpret the meaning of the dynamic facial expression, body and colour of the witch characters. Moreover, they need to associate the two metaphors applied in Soremo, the traffic light and smiley faces. This might be hard work and unsuitable for younger children aged 3 to 5 years old.

The Visual Analogue Scale (VAS) is reviewed in the next section.

2.5.3 Visual Analogue Scale (VAS)

Read and MacFarlane (2006) report that VAS is widely used in question formats. VAS uses pictorial representations that children can use to identify their feelings or opinions. This approach has been adopted as an alternative to the traditional open-ended and closed question formats. Huguet et al. (2010) reported in a literature review that there were inconsistent findings in terms of children's age suitability for using VAS. Some authors found that VAS is suitable

for children aged 5 and above, while others advised using VAS for older children, aged 7 and above. Figure 2.4 shows a children's version of VAS.

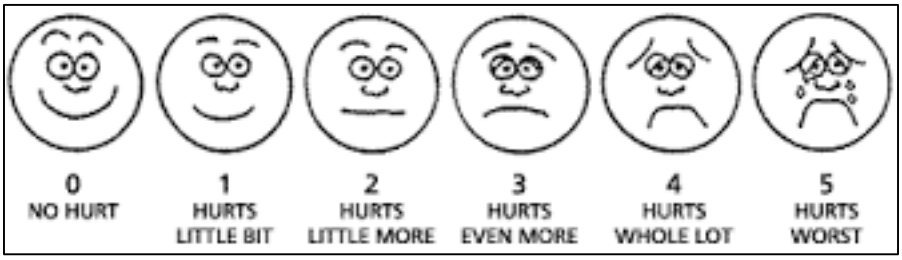


Figure 2.4: A children's version of VAS

In a study conducted by Shields et al. (2003), VAS was used with very young children. The majority of kindergarten children in the study could not complete the VAS accurately. Cognitive ability and the children's age were the best predictors of a child's inaccuracy in using VAS. The authors suggested that paediatric researchers should consider alternative rating scales to measure perceptions of children aged below 7. Hicks et al. (2001) selected VAS in one of their studies because it has been consistently reported as a well-validated measure of pain. The authors conducted the study with children aged 5 to 12.

Children's tools/instruments available for different age groups use different styles of representation. The smiley faces and linear scales used in VAS seemed suitable for children aged 5 and above. The smiley icons, traffic lights metaphor, and three-point scales used in Soremo were tested with older children aged 8 to 11. The photographic representations used in Oucher to measure the pain of children are suitable for the very young aged 3 and above.

At the beginning of this research, the Smiley Feelings Toolkit was designed using visual representation, i.e. smiley emoticons. Then photographs were used in the Pictorial Feelings Toolkit, as the findings from studies and interviews showed that photographs are more suitable for very young children. The following designs, the *Wafiy* Feelings Toolkit and the *Alisya* Feelings Toolkit also use photographic representations.

A five-point Likert scale was used in the Smiley Feelings Toolkit. Besides, semantic differential scales were adapted in designing the Smiley Feelings Toolkit, the Pictorial Feelings Toolkit, the *Wafiy* Feelings Toolkit, and the *Alisya* Feelings Toolkit.

Generally, semantic differentials are a technique used to measure the meaning of concepts or objects. This technique involves pairs of bipolar adjectives used as measurement scales (Osgood et al. 1957). It is assumed that adjectives can be used in a rating process to measure the feelings associated with attitude (Pearson and Bailey, 1980). The measurement process involves rating the measurement object on a series of bipolar adjectives scales separated by a fixed number of intervals (usually seven). The participant is asked to place a cross in the interval between a pair of adjectives to express his or her feeling toward the measurement object.

This research used different visual representations and different scales in designing the new evaluation tool. The details are described in Chapter 4.

Adult tools using pictures and animation are reviewed in the next section.

2.6 Adult Tools using Pictures and Animation

Four tools developed for adults that use pictures and animation representations are reviewed: Layered Emotion Measurement tool (LEMtool), Emocard tool, Product Emotion Measurement (PrEmo) tool, and Self-Assessment Manikin (SAM). The LEMtool uses eight caricature cartoons. The Emocard uses 16 cartoon faces. The PrEmo uses 14 cartoon animations. The SAM uses 15 graphics or pictorials. All of the tools were developed to measure emotion. The LEMtool is explained in the next section.

2.6.1 Layered Emotion Measurement Tool (LEMtool)

The Layered Emotion Measurement Tool (LEMtool) is a tool for measuring emotional responses during interaction with visual interfaces (Figure 2.5). The tool consists of eight images that display a caricature cartoon figure expressing four positive and four negative emotions using facial expressions and body postures. The tool can be used during interaction with a visual interface, such as a website, and allows participants to select elements of the interface that elicit a certain emotion (Huisman et al., 2013).

Figure 2.5: The eight images of LEMtool

The Emocard tool is reviewed in the next section.

2.6.2 Emocard Tool

The Emocard tool was developed by Desmet et al. (2001) to support users in expressing their emotional responses without the use of words. The developers believed that it is difficult to discuss users' emotional responses to products because users were embarrassed when asked to express their emotional response to products during previous studies. Two reasons were identified for this situation. First, emotions are difficult to verbalise, especially the type of subtle, low intensity emotions elicited by products. Second, asking users to describe their emotional response will require cognitive involvement, which may influence the response itself.

The Emocard consists of 16 cartoon faces with eight different emotional expressions represented by eight male and eight female faces. Each face represents a combination of two emotion dimensions, Pleasure and Arousal, similar to the PAD model, because these two dimensions are the most commonly accepted in psychology. The Emocard is divided into eight emotional categories and numbered one to eight with a pair of male and female faces representing each of the emotional states. The upper part contains excited emotions, the lower part contains calm emotions, the right part contains pleasant emotions, and the left part contains unpleasant emotions. The horizontal middle part shows average and the vertical middle part locates neutral emotional states. Figure 2.6 shows the Emocard tool.

Using the Emocard, participants can select a card that best expresses their emotional response to a product or put the cards in order of relevance. Agarwal and Meyer (2009) used the Emocard

with the adapted PAD scale in their comparative study to measure two versions of a Customer Relationship Management (CRM) application interface. They used traditional usability measures (like the number of errors and time taken to complete tasks) and the new combination instrument of the PAD scale and the Emocard that they combined. Both the PAD items and the Emocard images were placed in an online survey and were randomly presented.

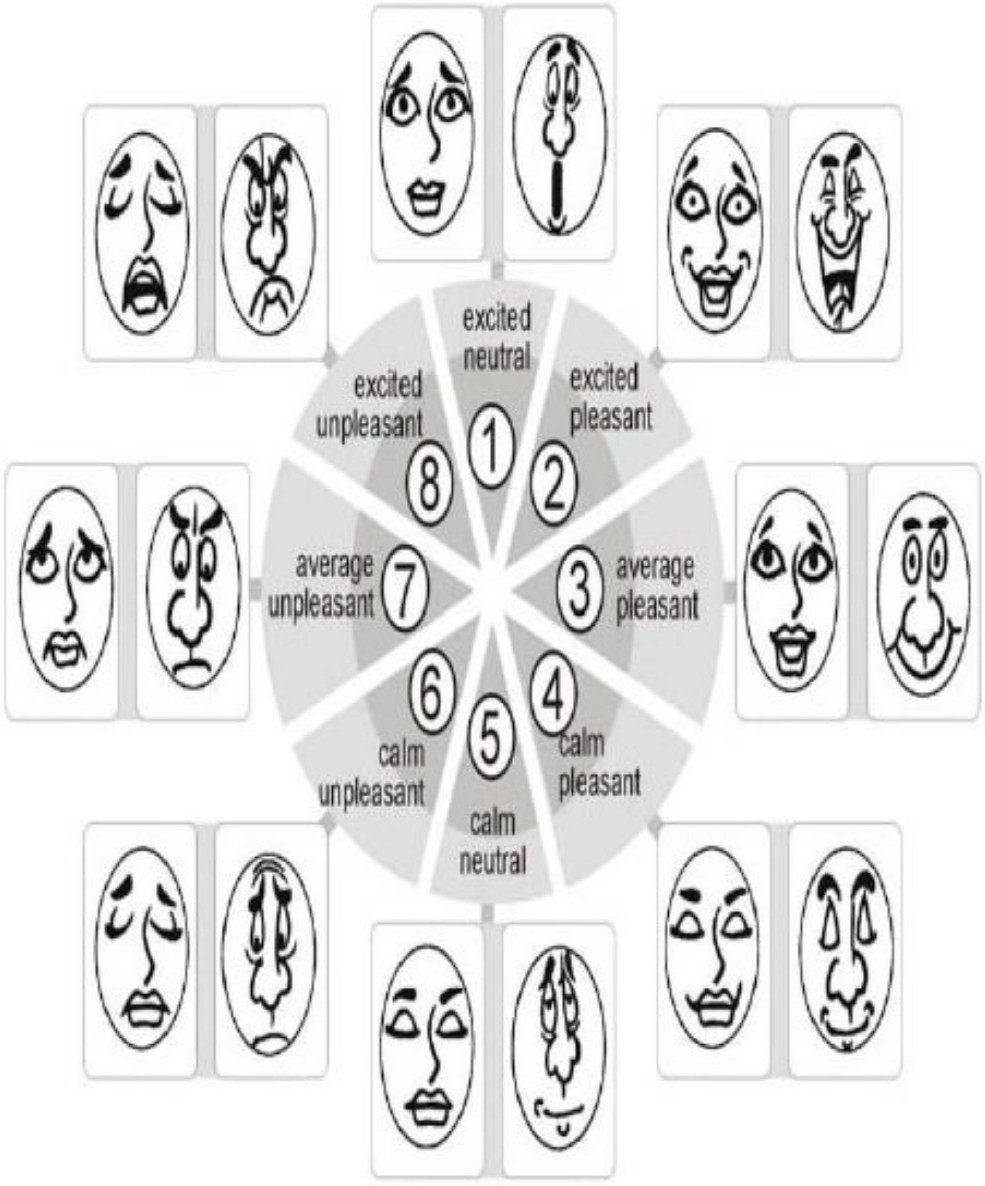


Figure 2.6: The Emocard Tool

In a study by Desmet et al. (2001), the Emocard was used to evaluate mobile telephones by two user groups: trend followers and security seekers. They found strengths and limitations of Emocard as summarized in Table 2.2 and also concluded that the Emocard can help the

participants to express their emotional responses towards products. But one important thing highlighted by them is that only minimum validation of Emocard has been done. They suggested more studies should be done to validate it. However, the Emocard's limitations have motivated the developers to create a new tool, Product Emotion Measurement (PrEmo), that can support designers when designing products that fit the emotional concern of the users.

Table 2.2: Strengths and limitations of Emocard (Desmet et al., 2001)

Strengths	**Limitations**
• Useful aid to discuss subtle and difficult to verbalise emotional responses to products. • Fast and intuitive to use. • Enables the designer to communicate with users without reducing them to research subjects. • The cards provide assistance, allow rich and amiable discussion. • Users find expressing their emotions using the Emocard is a pleasant task. • A convenient way to create informal atmosphere for respondents.	• The Emocard does not measure the actual emotion. It only measures perceived pleasantness and arousal.

Product Emotion Measurement (PrEmo) is reviewed in the next section.

2.6.3 Product Emotion Measurement (PrEmo) Tool

The Product Emotion Measurement (PrEmo) tool is a non-verbal self-report instrument that is used to assess emotional responses to consumer products. It was developed on the basis that people are expert in interpreting emotional expressions (Desmet, 2003). The developer highlighted that, in some cases, facial expression provides a more effective way of communicating emotion than verbal expression.

The PrEmo was built from 14 expressive cartoon animations that can measure 14 emotions; seven are pleasant (desire, pleasant surprise, inspiration, amusement, admiration, satisfaction, and fascination) and seven are unpleasant (indignation, contempt, disgust, unpleasant surprise,

dissatisfaction, disappointment, and boredom). Figure 2.7 shows the seven positive and negative puppet emotions on the right and left side of the computer screen respectively.

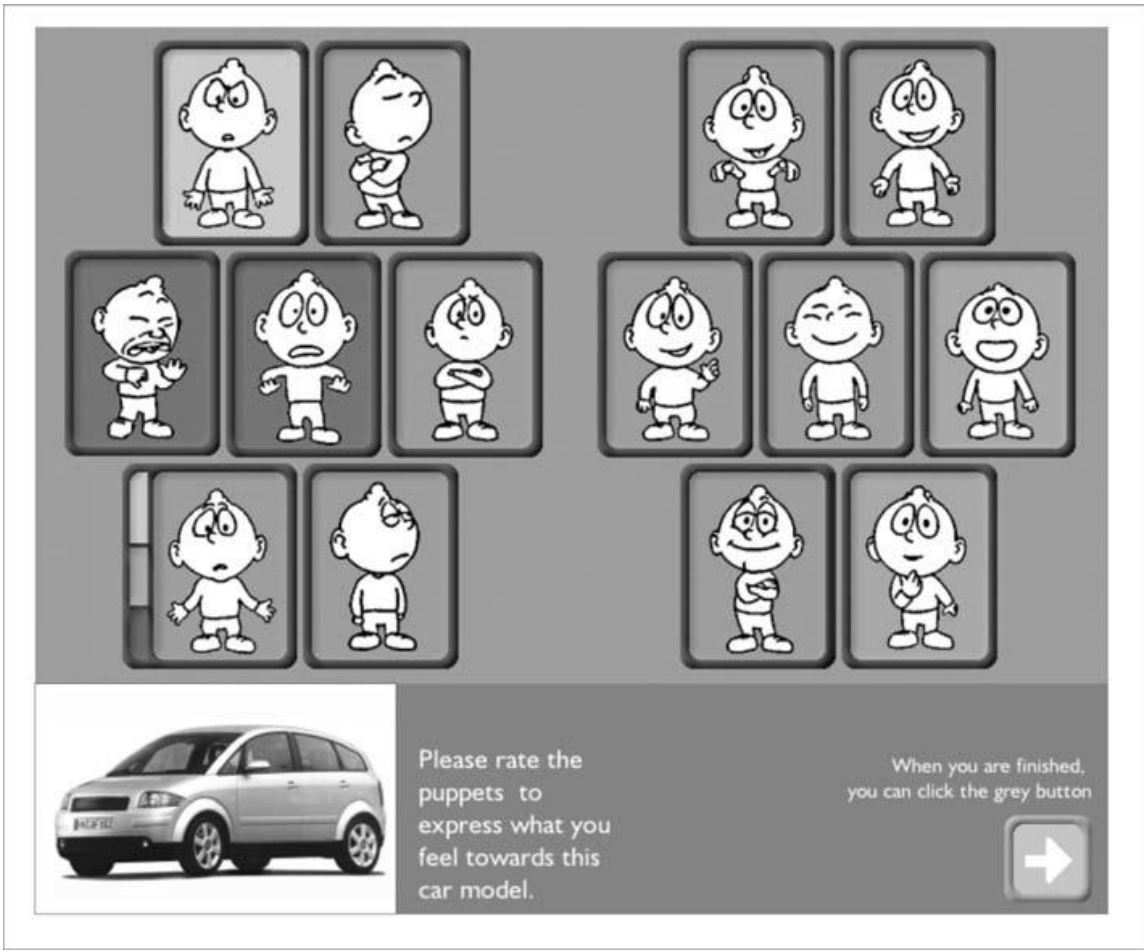


Figure 2.7: The PrEmo instrument interface with positive and negative puppets

PrEmo is a self-running computer-based instrument that has self-explained instructions to guide respondents during an experiment. It has two sections, top and bottom. The top section displays 14 animated cartoons and is accompanied by a hidden 3-point scale: *'I do feel the emotion'*, *'to some extent I feel the emotion',* and *'I do not feel the emotion expressed by this animation'*. The scales only appear on the animation frame side when the respondent activates the animation by clicking the cartoon. The bottom section has a stimulus picture and operation button. To use PrEmo, respondents are instructed to rate the animation cartoons after a picture of a product is shown to them. They must answer this question: *'does this animation express what I feel?*' Then they can click any cartoon and rate the 3-point scale to report their emotions towards the product that appears on the computer screen. The result of the scores is provided visually by the background colour of the animation frame.

PrEmo was used in various disciplines to measure emotions, such as consumer products (Desmet, 2003), advertising (Poels and Dewitte, 2006), or industrial design (Caicedo and Beuzekom, 2006). Poels and Dewitte (2006) analysed some different methods used for measuring emotions in advertising and also discussed their validity and applicability. They reported that PrEmo is now being used more in advertising literature. Initially, PrEmo was developed and applied to measure emotional responses to design, but it has increasingly been applied in advertising as well. Poels and Dewitte (2006) concluded that PrEmo is a user-friendly, valid and cheap instrument to measure emotional reactions in advertising.

In a study of emotions in consumer products by Caicedo and Beuzekom (2006), they listed weak and strong points of the PrEmo version 7.0, which consists of only 10 animated characters (Table 2.3). The study was conducted by 40 Dutch industrial design students with the main goal of finding the weak and strong points of two emotion measurement tools elicited by consumer products, PrEmo and the Geneva Emotional Wheel.

Table 2.3: Weak and strong points of PrEmo v.7.0

Weak Points	Strong Points
• The limited amount of emotions may constrain the subject from fully expressing what he feels. • The 3-point scale is a bit insufficient for the differentiation of the experienced emotional intensities, especially for a field like ours where we expect subtle reactions. • Some of the animations are not completely clear to the user (the one representing "desire", for example, was mentioned various times by the users as being incomprehensible).	• In general, the use of animations and sounds works as a good support for the representation of emotions. • Its graphical nature makes it ideal for cross-cultural environments. This was proven by the fact that, for our fieldwork, only the instructions had to be translated into Dutch before the tool could be used.

The Self-Assessment Manikin (SAM) is reviewed in the next section.

2.6.4 Self-Assessment Manikin (SAM)

The Self-Assessment Manikin (SAM) was developed by (Lang 1980). It is a self-report instrument that relies on Mehrabian and Russell's Pleasure, Arousal, and Dominance (PAD)

dimensions (Mehrabian and Russell, 1974). SAM is a non-verbal and graphic instrument used to rate the affective dimensions of valence, arousal, and dominance. In representing the pleasure dimension, it uses figures ranging from smiling happy to frowning unhappy. In representing the arousal dimensions, it uses an excited wide-eyed figure to a relaxed sleepy figure. In representing the dominance dimension, it uses changes of size from small to large. SAM was originally implemented as an interactive computer program, and was later expanded to include a paper-and-pencil version for use in groups and mass screening (Bradley and Lang, 1994). Figure 2.8 illustrates the original paper-and-pencil version of the SAM.

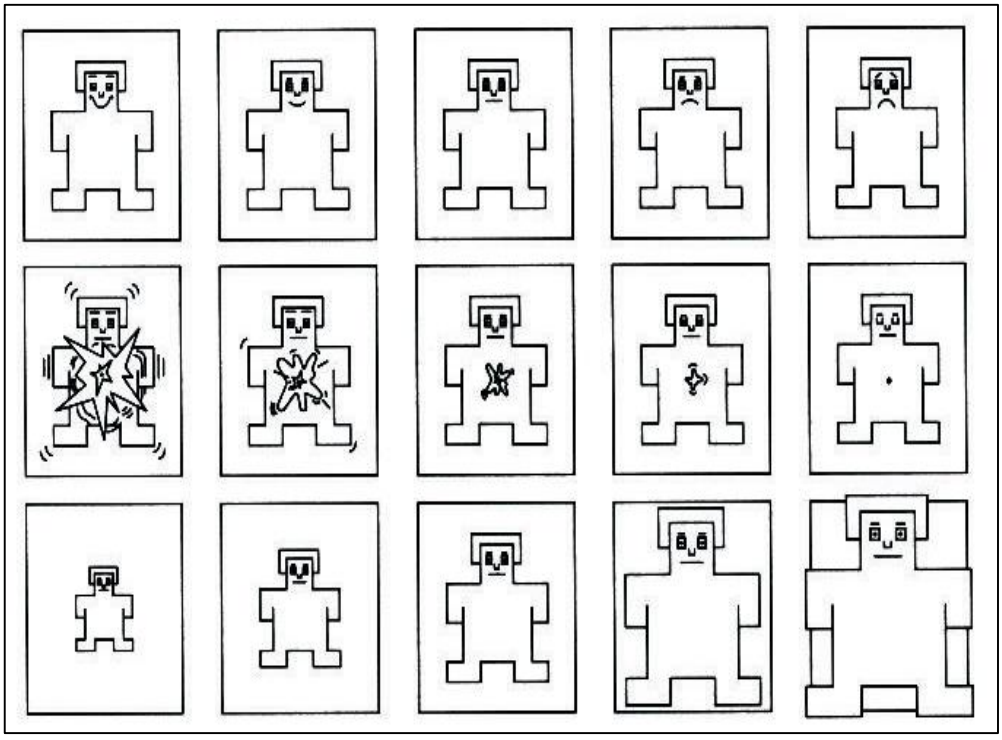


Figure 2.8: The paper-and-pencil SAM version

Generally, there are two versions of SAM, the paper-and-pencil and computer versions. Participants can select any of the five figures comprising each scale, or between any two figures, which results in a 9-point rating scale for each dimension in the paper-and-pencil SAM. But the computer SAM scale uses a 21-point scale, generating more discrimination in each dimension.

Lang et al. (2008) reported that they used a new version of the paper-and-pencil and the computer version of SAM in their study. In these versions, there are changes to the two last pictures in the third row (dominance row). These have assertive and aggressive looks to the

eyebrows and arms that are different from the original version, which has only the larger size, as depicted in Figure 2.9.

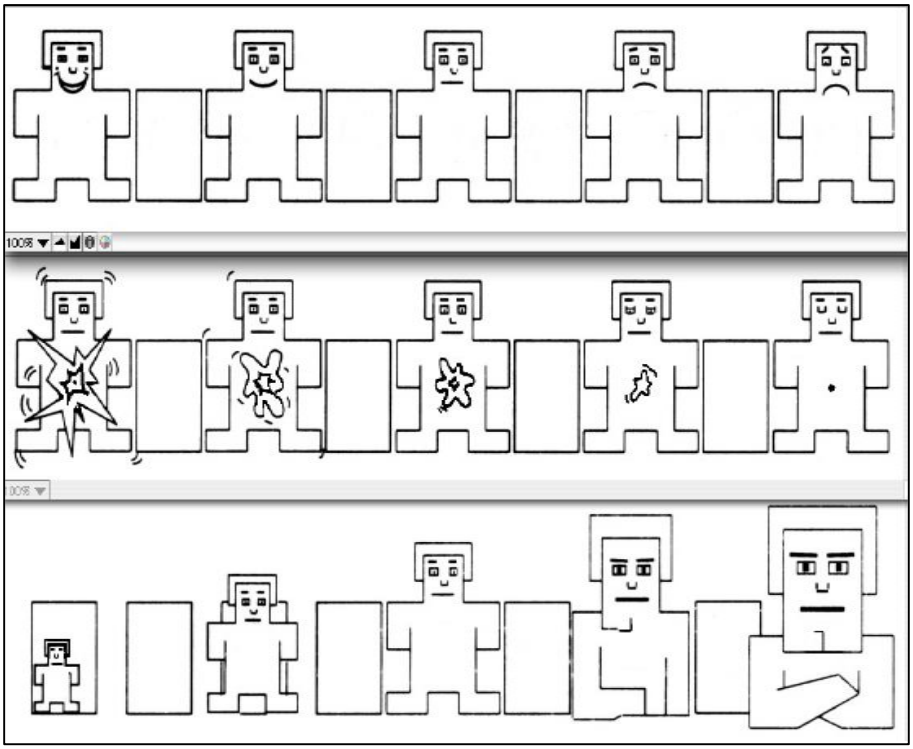


Figure 2.9: New version of paper-and-pencil SAM has assertive and aggressive look to eyebrows and arms in two last pictures of third row (dominance dimension).

SAM has been used effectively in measuring emotional responses in various situations including reactions to pictures, images, sounds, advertisements, and painful stimuli. Examples include studies of the emotion recognition system (Vera-Munoz et al., 2008; Grimm and Kroschel, 2005), biometric sensors (Jones and Troen, 2007), affective computing (Axelrod and Hone, 2005), computer games (Lim and Reeves, 2010), advertising (Poels and Dewitte, 2006), and user experience in HCI (Mahlke et al., 2006).

In a study by Jones and Troen (2007), the authors adapted the computer version of SAM according to their needs. They only chose two 5-point scales dimensions; valence (pleasure) and arousal. The valence scale ranged from *unhappy* to *happy* and the arousal scale ranged from *calm* to *excited*. Therefore, there were 25 possible combinations of emotions in the study. The participants involved were asked to view a slide-show of 21 images assembled from the International Affective Picture System (IAPS). Then they rated their emotions using an in-house application based on the SAM affective rating system.

SAM has also been used with children. For example, Greenbaum et al. (1990) reported their study using the SAM with 40 children to self-report their feelings when at the dentist. Participants aged 3 and half to 7 reported their feelings before and after being treated by the dentist by using the SAM questionnaires. However, the use of SAM was not explained or validated in the paper.

One main advantage of SAM is that it is a relatively easy method for quickly assessing pleasure, arousal, and dominance. Caicedo and Beuzekom (2006), in a study of emotions in consumer products, felt that the pictorial approach used in SAM makes it an ideal tool to use in a cross-cultural environment, and with illiterate subjects such as children, and it can be easily distributed as printed material to be filled in by hand, and also has very low technical requirements for implementation. Besides, the SAM is a promising basis for working on the recognition of natural emotions in a three-dimensional space (Grimm and Kroschel, 2005). But one issue is that SAM uses graphic characters to represent different emotions. Girard and Johnson (2009) found that children had difficulty in recognising the emotions portrayed by characters in a preliminary study at primary schools.

In a study by Bradley and Lang (1994), instructions were prepared and explained to different categories of participants: children and adults aged from 8 to 25 years old. The instructions were very detailed and clear about the experiment and how to understand and use SAM row by row. The researcher predicted that very young children, for example, nursery age (3 to 5 years old) might misunderstand the instructions and the graphics in the SAM. The tool might be unsuitable, impractical, and too advanced for them due to their mental and cognitive abilities. What the children need is a simple, clear, representable and understandable tool to assist them in expressing their feelings.

Child evaluation methods in CCI are reviewed.

2.7 Child Evaluation Methods in CCI

Evaluating children's interactive products is discussed in detail by Markopoulos et al. (2008). McKnight and Read (2011) listed some evaluation methods for evaluating children's products: survey methods, verbalisation (Think Aloud), Fun Toolkit, Structured Expert Evaluation Method (SEEM), This-or-That pairwise comparison method, and Problem Identification Picture Cards. In this thesis, only two evaluation methods are reviewed: Problem Identification Picture Cards (PIPC), and the Fun Toolkit. The PIPC is explained in the next section.

2.7.1 Problem Identification Picture Cards (PIPC)

Barendregt et al. (2008) proposed a new formative evaluation method called Problem Identification Picture Cards (PIPC). This method was developed using picture cards and the think-aloud method, whereby children can place pictures in a box to indicate if certain types of problems are being identified. The PIPC allows young children aged 5 to 7 to express usability and fun problems while playing computer games using picture cards and verbalisation. Using this PIPC, children may express more problems either verbally or with picture cards, or use both methods during the evaluation session.

The PIPC used eight pictures to represent feelings that children may have when different kinds of problem are found or when they really enjoy the game (see Figure 2.10).

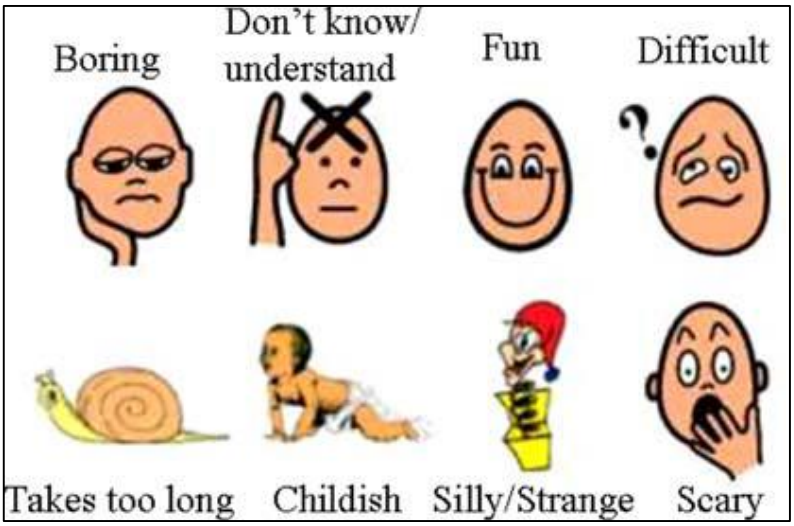


Figure 2.10: The eight pictures used for the picture cards

The authors predicted that one of the advantages of the PIPC is that the pictures can help to explain the different types of problems that children may experience more explicitly than by using verbalisation only. In addition, it helps the facilitator to explain the purpose of the test easily in a playful way. Besides, during testing, the picture cards can assist as a memory aid and can allow children to express problems in a non-verbal way. Thus children may express more problems than with standard thinking aloud.

A suggestion to further improve the PIPC is to investigate other versions of the picture cards that can improve the outcome of the user test. The versions might be designed with different

pictures and organization, using either fewer or more pictures. Further improvements are to place the pictures closer to the computer screen so that it is easier for children to use them together with the game; to ask children to point to the pictures instead of putting a picture in the box; and to use sufficient pictures that can remind children of the concepts. Children do not have to remember the meaning of the picture or need to determine the optimal set of pictures for the cards.

Potter et al. (2011) conducted an initial exploratory design session to understand two methods: PIPC and Gesture Think Aloud Protocol (GTAP) that will be used in developing an application to assist pre-literate young deaf children learn Australian sign language (Auslan). The authors found that the PIPC and the GTAP were suitable for the project. The methods helped children who had difficulties in expressing their thoughts or opinions.

The Fun Toolkit is reviewed in the next section.

2.7.2 Fun Toolkit

Read and Markopoulos (2008) described a Fun Toolkit that was originally developed by Read as a survey method to obtain children's opinions on technology. The Fun Toolkit was first reported as a concept (v.1) in (Read and MacFarlane, 2000). It is a survey instrument or tool that combines verbal and non-verbal pictorial representation and comprises three instruments: Smileyometer, the Fun Sorter, and Again Again Table (Figure 2.11). The tool was carefully designed to be Fun, Fast, and Fair (Read, 2008). The Fun toolkit started from a concept (v.1), and was developed, used, and reviewed until it became the Fun Toolkit (v. 3).

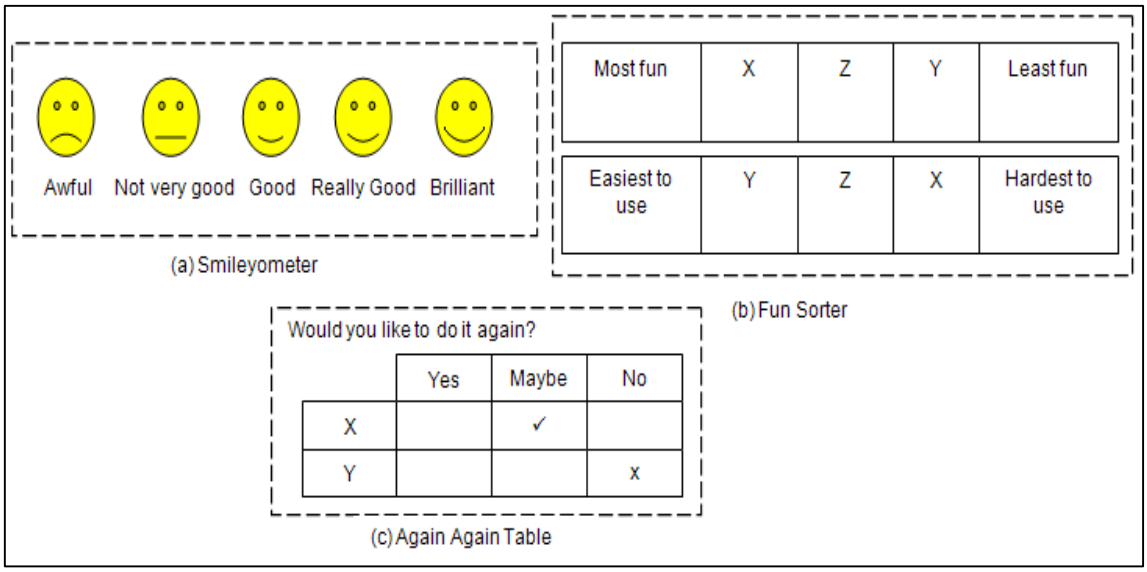


Figure 2.11: The Fun Toolkit consists of Smileyometer, Fun Sorter, and Again Again Table (source: Markopoulos et al., 2008)

The Fun Toolkit is used for measuring fun with children aged between 5 and 10, focusing on three dimensions of fun: endurability, engagement, and expectations (Read et al., 2002). The Smileyometer is the first instrument in the Fun Toolkit and is the one most used. It is based on Visual Analogue Scales (VAS) and uses a 1–5 Likert scale in text and pictorial representations that can help children to identity their feelings or opinions. Faces with supporting text underneath are represented horizontally to the children and they are asked to tick only one face. The faces in the Fun Toolkit were co-designed with children aged 8 and 9 and can be used before and after the children experience the computer technology. The Smileyometer features are easy and quick to complete and require limited reading and no writing ability (Read, 2008). But Read and MacFarlane (2006) revealed that the Smileyometer was a more useful tool for older children than for young children. This is because too many young children tended to choose the high values and so the data had little variability. Duh et al. (2010) used the Smileyometer in their study with older children aged from 13 to 16 years to evaluate a mobile game that was developed by children for children using a narrative-driven design approach.

The Fun Sorter is a tool used to compare a set of related technologies or products. It is based on a repertory grid and made up of n+ 1 columns (where n is the number of items being compared), and m+1 rows (where m is the number of constructs being used). There are different ways of completing the Fun Sorter. First, the children interpret the construct, then write a description of the technology in blank spaces. But, for children with poor reading and writing abilities, they

place picture cards (pre-prepared) on an empty grid after interpreting the construct. Some suggestions are made about using the Fun Sorter. The use of constructs needs special attention since children are unpredictable in understanding words. It is also recommended that each construct is presented individually for children younger than 8 years old. One important thing is to make sure that the children know what the cards represent if picture cards are used.

This tool is the most challenging one because the children are required to position and rank items in the construct. A good point is that it can be made such that no writing is required. Besides, according to Read, it is fast and fun to complete especially when stick cards are used. But the intention of the Fun Sorter is to record a child's opinions of the technology or activity, to gain a measure of the child's engagement (Read and MacFarlane, 2006).

The Again Again Table is a simple table that consists of four columns and n + 1 rows (where n is the number of activities under comparison). Using this table, a child needs to tick either 'yes', 'maybe', or 'no' for each activity or product. The table should be presented in a single sheet after the children have experienced all the technologies. This tool is most useful if three or more products or activities are being compared. In order to improve the validity, the first column can be presented in different orders for different children. It is advisable to minimize the rows (items to compare) so as to avoid children becoming bored. This table is easy and quick to complete, no writing activity is involved, and it only has one question to answer: *"Do you want to do it again"?* Thus, this tool is very suitable for younger children (Read, 2008).

Many studies (Sim et al., 2013; Sim et al., 2012; Sim and Horton, 2012; Read and MacFarlane, 2006; Sim et al., 2005) in CCI used the Fun Toolkit.

Alhussayen et al. (2015) and Yatim (2008) adapted the Smileyometer in their studies. Zaman et al. (2013) compared the Smileyometer and This or That methods with pre-school children to measure product liking. Zaman (2011) highlighted adapting the Fun Sorter – the instrument was used in a second phase of the author's PhD research, similar to the Fun Sorter. It allows for comparing several activities on several user experience constructs.

Both methods, the Fun Toolkit and Problem Identification Picture Cards (PIPC), are summarised in Table 2.4. A summary of chapter 2 is presented in the next section.

Table 2.4: Summary of the Fun Toolkit and the Problem Identification Picture Cards (PIPC)

Tool/Reference	Description of Features	Purpose	Target Users	Remarks (Strengths)	Weakness
Fun Toolkit / Read (2008)	Consists of three instruments - **Smileyometer**, **Fun Sorter**, and **Again-Again Table**.	A survey method to obtain children's opinions on technology.	Children aged between 5 and 10.	A validated tool. Can measure three fun dimensions - expectations, engagement, and endurability.	
• Smileyometer	It is based on Visual Analogue Scales (VAS) and uses a 1-5 Likert scale.	To identify children's feelings or opinions towards technology.		Complies with children's cognitive development. Easy to complete and requires no writing by the children (Sim et al., 2012).	
• Fun Sorter	It is based on a repertory grid and made up of n+ 1 columns (where n is the number of items being compared), and m+1 rows (where m is the number of constructs being used).	To compare a set of related technologies or products.		Fast and fun to complete especially when stick cards are used. It can be made such that no writing is required.	The most challenging tool because children need to position and rank items in the construct.
• Again Again Table	A simple table consisting of four columns and n + 1 rows (where n is the number of activities under comparison).	This tool is most useful if three or more products or activities are being compared.		The table is easy and quick to complete, no writing activity involved, and only has one question to be answered: "*Do you want to do it again"?* Very suitable for young children.	
Problem Identification Picture Cards (PIPC) / Barendregt et al. (2008)	8 pictures represent the feelings children may have when they experience a problem.	To aid young children to express usability and fun problems while playing a computer game.	Children aged between 5 and 7.	A new method that could help children to express more of their thoughts than the thinking-aloud method. Can cater for verbal and less verbal children. Easy for facilitator to explain the purpose of the test in a playful way by making the children guess the meaning of a certain picture and talk about it.	Cannot replace observation method.

2.8 Summary

Relevant literature and related works have been reviewed. The chapter started with Child–Computer Interaction and covered CCI versus HCI, User Experience (UX), and "Funology". Then, it continued with children and technology and touched on cognitive development, children's product development, and children's participation in research. Children's ability to recognise emotions in faces and how children recognise emotions are also reviewed. Children's tools/instruments that use pictures and animation, such as Oucher, Soremo, and Visual Analogue Scales (VAS) were reviewed. Oucher is a tool for measuring pain. Soremo is a non-verbal instrument outside the CCI literature for older children. VAS is a psychometric response scale that can be used in questionnaires.

Adult tools that use pictures and animation were reviewed as well: Layered Emotion Measurement Tool (LEMtool), EmoCard, Product Emotion Measurement (PrEmo), and Self-Assessment Manikin (SAM). Finally, two child evaluation methods, Problem Identification Picture Cards (PIPC) and Fun Toolkit, were reviewed.

In this research, a new evaluation tool was developed to evaluate feelings after very young children interacted with computer products. The tool used pictorial representations and bipolar adjectives.

Details of the methodology applied to develop a new evaluation tool for young children are explained in the next chapter.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter highlights the activities that have been conducted during the PhD research from the beginning until the end. The activities can be categorized into three phases: initial, development, and evaluation. Each phase has its own activities, process or procedures for implementing it. Three activities have been conducted in the initial phase, six in the development phase, and one in the evaluation phase. Figure 3.1 illustrates the relationship between the phases, activities, and outcomes in the PhD study.

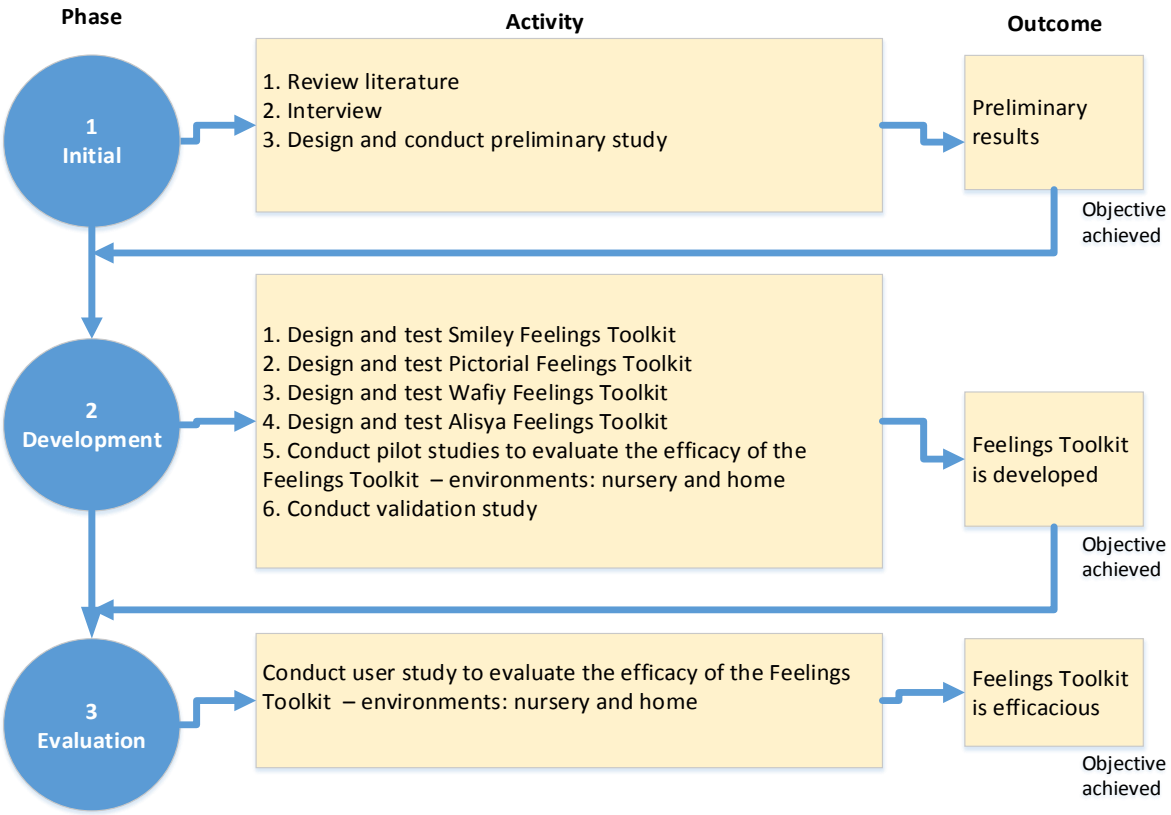


Figure 3.1: Research Methodology

In the initial phase, all the activities were conducted with the aim of initiating the development of a new evaluation tool for young children. The details are explained in Section 3.2. A

preliminary study was conducted in one local nursery in Glasgow, UK with very young children aged 3 to 5 years old. The study was repeated in a primary school environment with older children aged 5 to 6 years old. The details are in Section 3.2.4. In spite of difficulties and challenges working with very young children as explained in Sections 3.3.5 and 3.3.6, a decision was made to further this research with the nursery age group children. The reason was that very little research has been conducted within this age group, but the need is crucial.

In the development phase, the main goal was to develop an evaluation tool for very young children (see Section 3.3). Design and testing activities were done iteratively with the participation of nursery children, nursery staff, and parents in the UK. Validation of the photographs in the evaluation tool was done in Malaysia with kindergarten children. Parents also contributed to the validation process by helping to conduct the study in their homes.

Section 3.4 explains the evaluation phase. A user study was conducted in Malaysia with very young children in two different environments: kindergarten and home. The aim was to evaluate the efficacy of the new evaluation tool. The data were analysed by using qualitative and quantitative approaches. Section 3.5 concludes the research methodologies throughout the PhD research.

3.2 Initial Phase

In the initial phase, the activities done were reviewing related literature, interviewing nursery and primary school head teachers in preparing the paperwork to apply for approval from the Local Education Authority and Department Ethics Committee, and conducting a preliminary study. Many activities were done to understand the nature of the study. This was important as the lack of previous research with this age group meant that the current work is exploratory research. This study is focused on evaluating young children's feelings after interacting with computer products.

One preliminary study was designed and conducted with the aims of choosing a suitable place/context and a suitable age group of children to conduct this research. The study was conducted in two different environments, a nursery and a primary school. Before the study was conducted, relevant literature was reviewed, including preparing some documents.

3.2.1 Literature Review

Journals and proceedings articles, books, documents, websites, and magazines were read and reviewed to gain knowledge about researching with young children in evaluating computer products.

Prior to the study, ethical permission was obtained from the Local Education Authority and Departmental Ethics Committee. Documents such as an application letter (Appendix A), a supporting letter from the researcher's supervisor (Appendix B) and paperwork (study plan) were submitted to the nursery. The study plan consists of the background study, materials used, procedures, questions to be asked, and the ethics of the study (Appendix C). The nursery forwarded the documents to the Local Education Authority for approval. The next process was submitting the documents and also a parental consent form to the Ethics Committee in the Department of Computer Information Sciences (CIS) at the University of Strathclyde. The committee represents the university in giving approval to conduct any research that deals with human beings. This is to make sure that the researcher carries out the research according to agreed ethical standards.

After about a week, the researcher was informed by the nursery head teacher that the application had been approved.

3.2.2 Interviews

In the school, an appointment was made with the head teacher. The researcher interviewed the head teacher on 12 June 2009 and discussed the procedures necessary to conduct a study at the school. During the meeting, the head teacher granted general permission to conduct the study but wanted to check the availability and suitability of dates. According to the head teacher, the school was busy with lots of activities before the school holiday starting on 27 June 2009. On the afternoon of the same day, the researcher was informed by the primary school that the study could be conducted on Thursday, 18 June 2009. The researcher was asked to submit all the related documents.

The additional issue of rewarding participating children was discussed with the head teachers at both schools. In the nursery, the head teacher felt it would not be appropriate because very young children sometimes fight and scramble to get something from friends. In the primary

school, the same issue of rewarding participating children with small token-like cartoon stickers was discussed with the Deputy Head Teacher. The idea was agreed by the primary school as older children behave differently from younger ones so the researcher prepared three types of stickers to give to the primary school pupils.

Before the preliminary study was conducted, parental consent forms were distributed to the parents by the Child Development Officer Team Leader (CDOTL) in the nursery, who handled the forms distribution and collection process. According to this staff member, the nursery did not receive back all the forms from the parents. But the researcher was allowed to select any child to participate in the study as long as anonymity was applied. In the school, 25 forms were prepared and submitted to the head teacher. A Pupil Support Assistant (PSA) was assigned to be in charge of the consent forms and also to assist the researcher on the day when the study was conducted. The PSA distributed forms to eight Primary 1 pupils who were selected based on criteria that they like to play with computers. Only four forms were returned to the school.

In a normal condition, a Disclosure[1] Application should be made to the Scottish Government. Any study that involves children must go through a thorough check-up by the government. The researcher did not have to apply for the Disclosure because of just being 6 months in the UK. Besides, the nursery confirmed that the researcher did not have to apply for the Disclosure since she was working with children in an open area and not bringing any child alone to another room or closed area i.e. the toilet. In addition, the researcher had a Good Conduct Certificate (see Appendix D) that had been granted by the government of Malaysia (her own country).

A preliminary study in the local nursery was conducted in May 2009, after 5 months reviewing related literature and interviewing teachers. The study was repeated at the primary school in June 2009. The schools were chosen because they follow Scotland's education curriculum, known as the Curriculum for Excellence[2].

[1] A Disclosure is a document containing impartial and confidential criminal history information held by the police and government departments which can be used by employers to make safer recruitment decisions. Source: (https://www.disclosurescotland.co.uk/disclosureinformation/index.htm)

[2] Curriculum for Excellence is designed to achieve a transformation in education in Scotland by providing a coherent, more flexible and enriched curriculum from 3 to 18 years old.
Source:
(http://www.educationscotland.gov.uk/learningandteaching/thecurriculum/whatiscurriculumforexcellence/)

3.2.3 Conducting Preliminary Study

A preliminary study on evaluating young children interacting with the CBeebies website was conducted in two different environments: at a local nursery and a local primary school. The aims of the study were to choose a suitable place and a suitable age group of children to conduct the research; 3 to 5 years old at the nursery or 5 to 6 years old at the school. Four nursery children and five school children voluntarily participated in the study.

3.2.3.1 The Nursery Background

The nursery school is situated in Glasgow, UK and offers two sessions, morning and afternoon. The morning session starts at 8.45 am and finishes at 11.45 am. The afternoon session starts at 1.00 pm and finishes at 4.00 pm. There are 10 permanent staff, who are the Head Teacher, Bilingual Teacher, English Additional Language (EDL) Teacher, Child Development Officer Team Leader, and Child Development Officer. Table 3.1 shows the staff roles and responsibilities at the nursery. There are also support staff at the nursery: a clerical assistant, janitor, cleaner and dining attendant.

Table 3.1: Staff at the nursery school

Position	Roles and Responsibilities
Head Teacher	To be responsible for the staff, the curriculum, resources, communications, corporate life of the school, relationships, administration and finance, and development of establishment in line with regional policies.
Bilingual Teacher	To support bilingual children and promotes equal access to the curriculum by teaching in mother tongue where possible.
English Additional Language (EDL) Teacher	To prepare a language support programme suitable for the needs of the individual child in accordance with the Pre-5 curriculum guidelines. Assesses, reports and records the work of the 3-5 year old pupils in regard to the language support programme.
Child Development Officer Team Leader	To be responsible to head teacher and part of management team support for staff and children.
Child Development Officer (CDO)	To assist in the provision of high quality education and care for young children and their families.

The capacity of the nursery is 80/80. This means that for each session, the maximum number of children is 80, which are 65 for part-time places and 15 for full-time places. The full-time places

are arranged for children individually. In the 2008/2009 session, there were 79 children attending the morning and afternoon nursery sessions. Table 3.2 shows enrolment for the 2008/2009 session in the nursery school.

Table 3.2: Enrolment for 2008/2009 session in the nursery school

Pupils	Morning	Afternoon
Boys	44	39
Girls	35	40
Total	**79**	**79**

Besides English, there are various languages spoken by the children in the nursery such as Urdu, Punjabi, Malay, Mirpuri, Pushto, Arabic and Farsi. Table 3.3 shows children and languages spoken in the nursery for the session 2008/2009. The nursery has children from various ethnic backgrounds and the majority are Pakistani.

Table 3.3: Children and languages spoken in the nursery for session 2008/2009

Language	Number of Children
Urdu	54
English	39
Punjabi	36
Malay	14
Mirpuri	7
Pushto	3
Arabic	1
Sesotho	1
Twi	1
Farsi	1
Berber/Algerian	1

In the nursery, there are four rooms fully equipped with toys, books, and other children's material, but only Room 1 and Room 2 have computers. Room 1 was the place where the study was conducted. Although there are three computers available in the room, only one computer (in the middle) with a speaker was used in the study. During the study, children were asked to play

with/explore any computer games on the CBeebies website. The preliminary study was repeated at a primary school with older children aged 5 to 6 years old.

3.2.3.2 The School Background

The primary school is also situated in Glasgow, UK. The school's three-storey building was built in 1886. The school had 15 teaching and 5 support staff in the 2008/2009 session. Table 3.4 shows the general responsibilities of the teaching staff. The school has pupils from different minority ethnic communities such as Pakistani, Malay, Czech, and Arabic. The working capacity of the school is 260. But in the 2008/2009 session, the roll was 219 pupils, 122 boys and 97 girls.

Table 3.4: Staff at the primary school

Position	General Responsibilities
Head Teacher	To conduct the affairs of the school under the overall direction of the Director of Education.
Depute Head Teacher	To assist, and where necessary, to deputise for the Head Teacher in the conduct of school affairs.
Principal Teacher	To be responsible for the leadership, good management and strategic direction of colleagues and pastoral care within school, develop curriculum and assure quality, and develop school policy for the pupils' behaviour management.
Class Teacher	To teach, develop school curriculum, prepare pupils for examination, provide advice and guidance, promote and safeguard pupils' health, welfare and safety, work in partnership with parents, support staff and other professionals.
Probationer Teacher	Same remit as Class Teacher but, during first year's probation, teaches for only 3.5 days and undergoes professional development for 1.5 days.
English Additional Language (EAL) Teacher	To offer a varied range of teaching strategies for team teaching within Infant Department, individual pupil support, small group collaborative learning, access, record and report bilingual pupils' work and offer a range of services to support bilingual pupils and school staff.

The school starts at 9.00 am and finishes at 3.00 pm. There are two breaks, one in the morning and one in the afternoon. In the school, there are seven classrooms for Primary 1 to Primary 7. The Primary 1 classroom, which is located on the first floor, was where the study was conducted. There were 12 boys and 15 girls in the class and all of them could speak English.

The classroom was provided with 2 personal computers connected to the internet. For the study, the researcher used the CBeebies website for the children to play on and explore the computer before the evaluation session was conducted.

3.2.3.3 Platform: The CBeebies Website

The CBeebies website is based on a very popular children's television channel in the UK, CBeebies. The CBeebies is a television channel produced by the British Broadcasting Corporation (BBC) aimed at children from 0 to 6 years old. It was first launched on 11 February 2002. The channel has won many awards, for example at the BAFTA Children's Awards every year since 2002 to 2009 excluding 2003 and also Best Pre-school Live Action Series awards in 2002, 2004, 2005 and 2008 (Wikipedia, n.d.).

Figure 3.2 shows the interface/screenshot of the CBeebies website. There are 18 main links on the left-hand side of the screen, such as Home, All CBeebies Characters, Fun and Games, Stories and Rhymes, Print and Colour, Make and Do, Music and Songs and many more. At the Home screen, the content on the right-hand side changes regularly. This interactive website, which contains all multimedia elements like graphics, audio, video, animation and text, can be accessed through URL http://www.bbc.co.uk/cbeebies. For the study purposes, children were asked to play on/explore the Fun and Games Section only.

Figure 3.2: CBeebies screenshot

3.2.3.4 Procedures

The study comprised five main activities: greet the children, introduce the researcher, ask the volunteer child to play on/explore the Fun and Games section in the CBeebies website for 5 minutes, interview the child for about 5 minutes, and ask the child to draw the character that they liked most from the games. Ten open-ended and closed questions were prepared for the study. Only some of the questions were answered by some nursery children because of a few factors such as the children feeling bored and being unable to understand the question, but in the school, all the questions were answered by the children. The question types are explained in Section 3.2.3.4.1. The activities conducted in both the nursery and primary school are summarised in Table 3.5, which shows the similarities and differences in the practice. The main differences are in the children's recruitment and researcher's introduction.

Table 3.5: Procedures applied in two different settings

Activities	Nursery	School
1. Recruit children	The researcher made several visits to familiarise herself and the nursery pupils. The head teacher assigned a Child Development Officer Team Leader (CDOTL) to help the study. The CDOTL roles were: Distribute and collect parental consent forms. Give advice and suggestions i.e. to get children's participation naturally by waiting at computer desk until interested child comes to participate in the study. The researcher worked alone in the study room.	The researcher made only one visit on the day of the study. The head teacher assigned a Pupil Support Assistant (PSA) to help the study. The PSA roles were: Distribute and collect parental consent forms. In charge of selecting and arranging children's turns to participate in the study i.e. took children one by one from the gymnasium to the study room and vice versa. The PSA came to the classroom at interval time to be in charge of the participant's turn.
2. Introduce researcher	The researcher introduced herself informally to each participant by asking: "Do you know me?" and answering it by saying, "I am Mrs Y."	The researcher was introduced by the class teacher formally in front of the class before the study was conducted.
3. Ask volunteer child to play on/explore computer	The researcher showed a laminated screenshot from the CBeebies website to each participant. The participant chose any game that they were familiar with/liked. The participant was allowed to	The researcher showed a laminated screenshot from the CBeebies website to each participant. The participant chose any game that they were familiar with/liked. The participant was allowed to

	play the game for 5 minutes. The study finished before snack time (around 11.00 am). Each child spent around 10 minutes for interviewing and drawing.	play the game for 5 minutes. The study stopped for 15 minutes because of school playtime. This happened because of the extra time needed to bring each participant from/to the gymnasium. Each child spent round 10 minutes for interviewing and drawing.
4. Interview	The researcher prepared ten open-ended and closed questions to ask each participant.	The researcher prepared ten open-ended and closed questions to ask each participant.
5. Ask children to draw a character	The researcher asked each participant to draw the character they liked most from the exploration of the CBeebies website.	The researcher asked each participant to draw the character they liked most from the exploration of the CBeebies website.

3.2.3.4.1 Questions and Interview

In both locations, if the child remained long enough to be interviewed, the researcher asked a range of open and closed questions. These questions were to explore what kinds of questions children of different ages were comfortable answering and what kinds of responses they were willing to give. The questions were deliberately conversational in nature, starting with closed questions, which are easier to answer. The questions were as follows:

Q1: Have you seen this program before?

Q2: Have you used this program before?

These two closed questions were to gain insight into a child's previous experience, which may be useful for contextualising the responses to later questions and for exploring what the child found fun about a game.

The next three questions are on general experience of using this popular site and asked if the children were familiar with the site. The question block starts with a closed question, leading to a simple choice question and finally an open question.

Q3: Do you like to play games from this website?

Q4: Which game do you like to play?

Q5: Why do you like to play this game?

The following questions explore what aspects of a program or game might be enjoyable for a child. The researcher was particularly interested in the evaluation of fun from a child's perspective and wanted to explore what judgements a child might give through the use of open questions.

Q6: Do you like the colours used?

Q7: Do you like to hear songs from this game?

Q8: How do you feel after playing this game?

The second last question tested a child's ability to identify, express, and share their feelings of having fun by telling other people. In this question, friends are highlighted because of their importance as the closest person for them to play with.

Q9: Do you want to recommend this game to your friend? Why?

The final question, really a task, asked the child to draw the character they liked most from their exploration. This exploratory activity might be useful to identify whether children had fun interacting with the game. Their enjoyment of playing a self-chosen game can be transformed into a cartoon character by drawing explicitly on a piece of paper.

Q10: Can you draw the character that you like most from the site?

The final task the researcher asked the children to engage in was to draw their favourite character from the game they chose to play with. This was an attempt to see if the researcher could learn something about what children enjoyed about a game from an associated activity. The quality of the drawing here was not important as the researcher wanted to create a stimulus for discussing their experience of the game.

3.2.3.5 Findings

Ten questions were planned, but the questions actually asked of the nursery children were determined by the child's mood and ability to answer. The researcher took care not to place any pressure on any child or to continue if it became clear that a child was becoming bored or did not understand the questions. Some children did struggle with physical limitations such as hand and eye coordination in using the computer. But all the questions were asked of the school children. However, only two participants could understand and answer all of them. Table 3.6 summarises the outcomes gathered from each study from the questions aspects.

Table 3.6: Question types and feedback gathered from participants

	Questions	Places	
		Nursery School	**Primary School**
1.	Q1 – Q4	The questions were easily answered by the children. They were very familiar with the websites. In fact, they could go directly to the page without any help. The children said that they watch CBeebies TV at home almost every day. Only one participant did not want to play any games from the CBeebies websites and chose another game.	Questions 1 - 4 were easily and confidently answered by the children. They were very familiar with the websites. One participant managed to go to the CBeebies websites by clicking *Favorites Center.*
2.	Q5 – Q7	Question 5 was more difficult for children to answer and was not asked of all participants. It was clear that open reflective questions were difficult for very young children to answer. Q6 and 7 could be answered by many children as they were closed questions.	The open question 5 was answered by two children only. The other children had difficulties in giving reasons. Questions 6 – 7 also could be answered by all of them.
3.	Q8 – Q9	Questions 8 and 9 were only asked of children that showed an ability to communicate and reason, but were difficult to answer. It was particularly difficult for children to reason about emotions. Although many computer programs and games are designed to be fun and enjoyable, very young children could express enjoyment but not reason about it.	Children had difficulty giving reasons to question 8 and part of question 9. But they were more confident in their responses, saying they didn't know or did not have an answer. Overall, the children showed a greater ability to understand and communicate.
4.	Q10	Most of the children could not answer question 10. All of them were unable to draw except one girl. The others were only able to colour the paper that had been given to them and engaged in little discussion related to the game. One child, when asked about the drawing, said the character he liked most is *Batman*, which is not in the CBeebies websites and out of context. Most very young children naturally could not produce recognizable drawings.	All participants could draw a character related to the experience of the game. They were able to draw the cartoon character although it was not exactly the same as seen on the computer screen. In particular, one drawing was so good as to be easily recognized by the researcher.

3.2.3.6 Discussion

The aims of this preliminary study are to choose a suitable place and a suitable age group of children to conduct the research. As more computer products and particularly edutainment websites are being created for very young children, it is important to understand the challenges of evaluation by such children and how best to engage them in the process of evaluation. In this section, the researcher will summarise some of the major trends from the study.

Recruitment

Recruitment is a challenge when working with very young children. In the nursery context, where the main activities are play, children's participation had to be voluntary. Hence only children who were interested took part and their involvement ceased when they were bored. One child got bored playing after two minutes and walked away to play with other things in the room. As noted before, other environmental distractions such as good weather or interesting toys made computers less attractive. Another participant refused to play any CBeebies game but would play other games. Some children looked shy and took longer to approach the researcher, although they were interested in joining the study.

The researcher deliberately chose a real-life setting to conduct the evaluations, as children's use of computer products naturally takes place within environments where there are choices of activities. If a very young child becomes bored or has more interesting activities – particularly those that involve other children – then they can quickly lose interest in the evaluation. Although this means that evaluations with very young children may often be snap-shots of interactions with computer products being picked up and quickly dropped, this does lend realism to the evaluation compared to the actual use of a computer product.

Recruitment also relates to the child's confidence in the researcher. In this case, the researcher took care to become a familiar part of the nursery environment. However, the researcher did notice that some children took longer to trust her than others, and she devoted time to engaging with children in other activities, such as singing songs, to help engender a relationship of trust with children.

In the school context, all children were comfortable with computers and the school was happy to assist in direct recruitment within the class. This will not be the case in all schools, but the context of a school – where children are expected to learn as well as play - does mean that children are becoming used to engaging in activities that they have not chosen themselves.

Verbalisation

All children in the school environment were better at verbalising and general communications. All could choose a game and explain why they chose it. They could not answer all the open-ended questions, but some could answer the most difficult questions and give reasons for their answers, e.g. why they would recommend a game to friends, which could be used to gain additional information on the attractive features of a game.

In the nursery environment, the children were more reluctant to answer questions and at least one child nodded rather than verbalising responses. In the same environment, two children gained confidence from participating together. Very young children also had more difficulty in understanding questions. When researching with very young children, therefore, it may be necessary to have different means of asking questions and to carefully consider what kinds of questions children may be able to answer.

Evaluation as a Process

A particular issue that arose was the degree to which the process of evaluation can be separated from the process of interaction with a computer product. Often evaluation techniques are separate from the act of interaction, i.e. the evaluation takes place after the interaction. Alternatives that can be used at the same time as interaction, such as thin -aloud, are not suitable for very young children due to the need to verbalise and reason.

When the researcher asked the school children to draw a favourite character from the game, most could carry out this task and could discuss the character with reference to the game. However, with the children in the nursery, this task largely failed and the act of drawing was seen as a different activity to the game. This raises questions about how to connect evaluation to the experience of interacting with a product.

3.2.3.7 Limitations

This study was a small exploratory study conducted within one nursery and one school environment. The researcher used only one website, although many games were available from this site, and carried out only one round of evaluations. Nevertheless, the researcher believes that the findings are of interest in pointing to some difficulties in working with a distinct group of computer users. This was a challenging, but rewarding, group to work with and it was clear that they have specific needs in terms of evaluation. The researcher chose to work with the nursery school pupils to explore what kinds of evaluation are attractive and useful to them in

evaluating products designed for their use. Specifically, the researcher investigated methods that enable them to express emotional reactions to computer products.

3.2.4 Summary

The preliminary study focused on a computer edutainment website. This was to provide children with a familiar computer product so that the researcher could concentrate on the process of evaluation.

From the study, the researcher learned that working with nursery children is very challenging. Obviously, it was difficult to get data from the very young children. They can easily feel bored, do not understand some questions (*how* and *why* questions), cannot necessarily reason about their experience, may experience language barriers due to their limited vocabulary and may have physical limitations such as hand and eye coordination in using computers.

The young children in primary school had indicated that there were possible differences when working with children of different ages. Older children are more confident, easily understand instructions, and have better communication skills. This has implications for the design of computer products for children but also for evaluation: evaluations of computer products with very young children cannot rely on the relatively open-ended data gathering methods (such as interviews and think-aloud) common in evaluations of older people.

The researcher continued the research by developing a new evaluation tool for the very young in the development phase.

3.3 Development Phase

In the development phase, the researcher developed a new evaluation tool for use with and by very young children to evaluate feelings after interacting with computer products. Some earlier tools have been developed for and used by older children in research by Read (2008) and Barendregt et al. (2008). However, it is difficult to find a suitable tool for very young children. The researcher applied an iterative design in developing the evaluation tool.

3.3.1 Iterative Design

Iterative design focuses on activities of designing, testing, and redesigning the evaluation tool. It was adopted rather than a traditional approach like the Waterfall Model because it is universally accepted and widely recognised, e.g. in ISO 13407 standards (Markopoulos et al., 2008). The process started with designing a new evaluation tool using paper-based prototyping. This was chosen for this study because it is the most time-efficient for modelling a new thing according to suggestions on developing a new website made by McCracken and Wolfe (2004).

The iterative process of designing–testing–redesigning the tool can be divided into six stages (Figure 4.1). Details of the stages are in chapter 4. A summary of the stages is explained below:

In stages 1 and 2

In stages 1 and 2, the researcher designed the first and second prototypes (see Section 4.2.1 and Section 4.2.2). The prototypes were tested by the nursery children in a series of studies conducted in a local nursery in Glasgow, UK (see Section 4.2.1.1 and Section 4.2.2.1). Besides the children, nursery staff also contributed in giving feedback about the prototypes (see Section 4.2.2.2). The results on children's feelings and responses to using and testing the prototype were compiled. The methods used to gather data from the children were interviewing and observing them in the studies. Data gathering methods are explained in detail in Section 3.4.2.

In stages 3 and 4

Next, in stages 3 and 4, the researcher designed the third and fourth prototypes based on the feedback gathered (see Section 4.2.3 and Section 4.2.4). The testing process was repeated until the researcher finalised the design of the evaluation tool (see Section 4.2.3.1 and Section 4.2.4.1). To understand very young children's reactions to using the tool, they were observed in a series of exploratory sessions.

In stage 5

In stage 5, the researcher conducted a series of exploratory sessions in the UK; session 1, session 2, and session 3. Sessions 1 and 2 were conducted in a local nursery in Glasgow, UK. The aims were to observe the prototype used by nursery children aged 3 to 5 years old after interacting with computer products and non-computer products (see Section 4.2.5.1 and Section 4.2.5.2). The findings from sessions 1 and 2 showed positive results. The researcher conducted exploratory session 3 with children in the home environment to observe how they used the

prototype compared to the Smiley-adapted-to-the-Feelings Toolkit prototype style (see Section 4.2.5.3). The findings from session 3 revealed that the *love* photographs in both of the prototype versions were not clear.

In stage 6

Finally, in stage 6, the researcher conducted a validation study in Malaysia (see Section 4.2.6). The aim of the validation study was to ask older children aged 6 to identify photographs used in the existing Feelings Toolkit. Children were asked to identify photographs in the original tool. The findings from the study were used to produce a final version of the evaluation tool.

The children's participation in the development phase is explained in the next section.

3.3.2 Children's Participation in Development Phase

In stages 1 to 6, the researcher involved children as in rung four (assigned but informed) of the Ladder of Participation by Hart (1997) (see Section 2.3.3). A summary of the stages is explained below:

In stages 1 to 4

In stages 1 to 4, the researcher assigned a task for each child to play with a computer product, to choose one version of the Feelings Toolkit they liked most, and to answer questions about their feelings after playing on the computer. Before that, the researcher informed the child about herself, the study, and the tool. They were informed that they were assisting in the development of a tool that would be used, in future, to evaluate feelings in children.

In stage 5

In stage 5, in the nursery, the researcher assigned a task for each child to play with a computer product in exploratory session 1 and to play with non-computer products in exploratory session 2. Then the researcher asked the child to choose one version of the Feelings Toolkit they liked most, and to answer questions about their feelings after playing on the computer. Before that, the researcher informed the child about herself, the study, and the tool. They were informed that they were assisting in the development of a tool that would be used, in future, to evaluate feelings in children.

In exploratory session 3 at home, parents assigned a task to their child to play with a computer product, to choose any version of the evaluation tools (Feelings Toolkit versions or Smiley-adapted-to-Feelings Toolkit) that they liked most, and to answer questions about their feelings after playing on the computer. Before that, the parent informed their child about the study and the tool. They were informed that they were assisting in the development of a tool that would be used, in future, to evaluate feelings in children.

In stage 6

In stage 6, the researcher assigned a task to each child to identify pictures in the existing Feelings Toolkit. Before that, the researcher informed them about herself and about the study. They were informed that they were assisting in the development of a tool that would be used, in future, to evaluate feelings in children. Then the researcher invited the kindergarten children by saying: *"Who wants to take part, please raise your hand"*. The researcher identified the children and assigned them turns. Only one child was selected at a time to participate in the study. The child was invited into the kindergarten's office, where the study was conducted.

The next section highlights the Feelings Toolkit versions.

3.3.3 Versions of Feelings Toolkit

The researcher developed a few versions of the evaluation tool. Firstly, the researcher developed a quick paper-based prototype that contains 10 smiley faces and was named the Smiley Feelings Toolkit. Secondly, the researcher developed an evaluation tool containing six different children's photographs (pictorial). Figures 3.3 and 3.4 show the two versions.

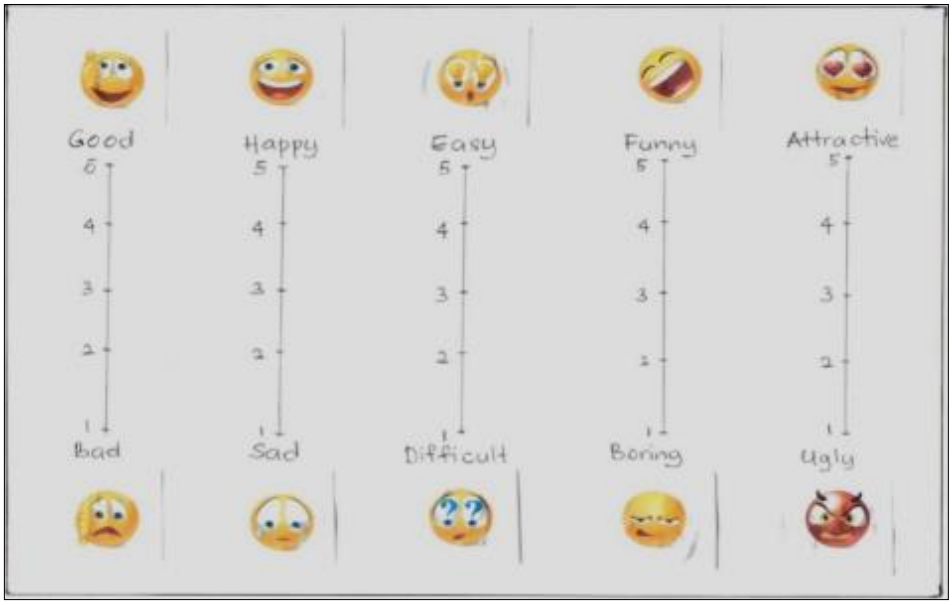


Figure 3.3: Smiley Feelings Toolkit

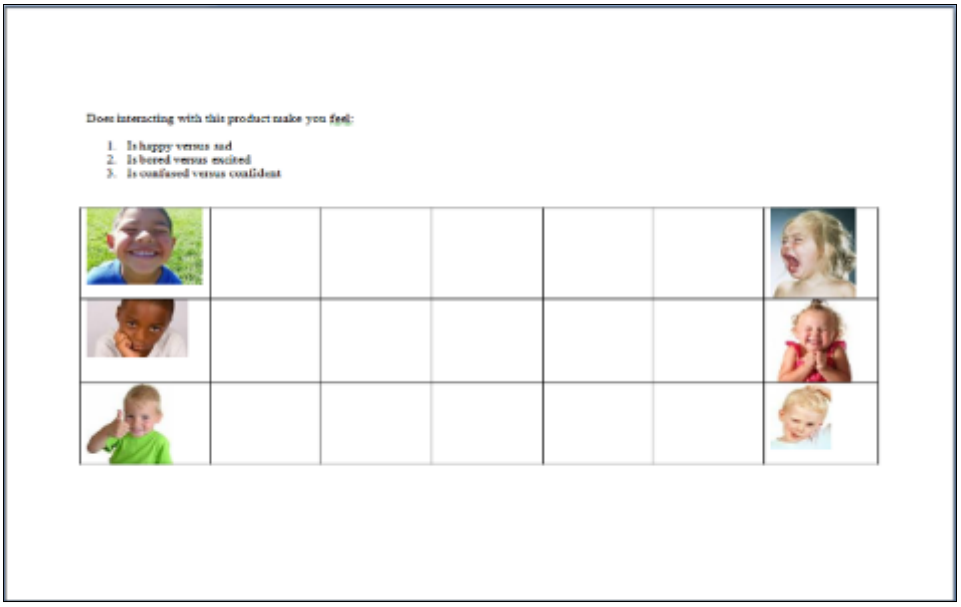


Figure 3.4: Pictorial Feelings Toolkit

Then, the researcher developed a version that contains nine nursery-aged boy photographs and four bipolar adjectives. Next, the researcher developed a girl version, the same as the boy version but using nursery-aged girl photographs. The two versions were named the *Wafiy* Feelings Toolkit and *Alisya* Feelings Toolkit accordingly, as shown in Figures 3.5 and 3.6.

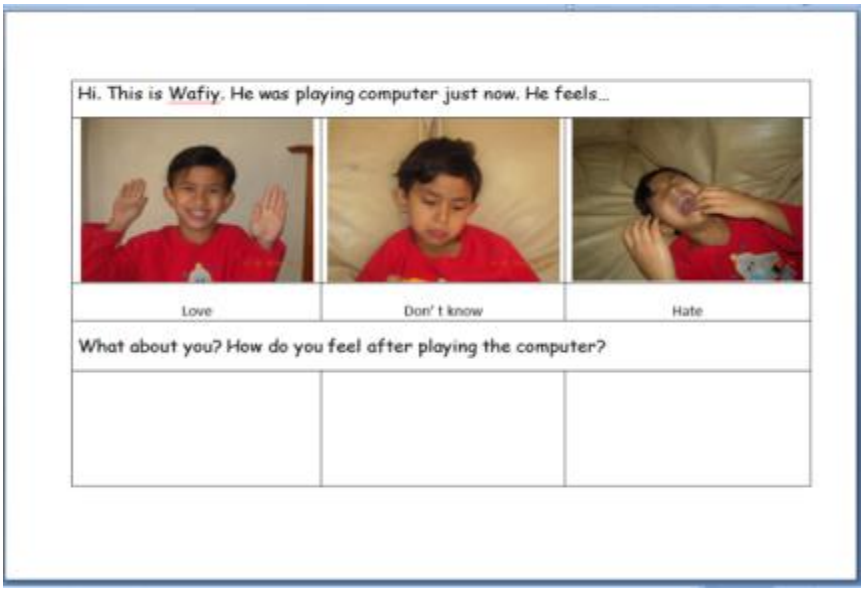


Figure 3.5*: Wafiy* Feelings Toolkit

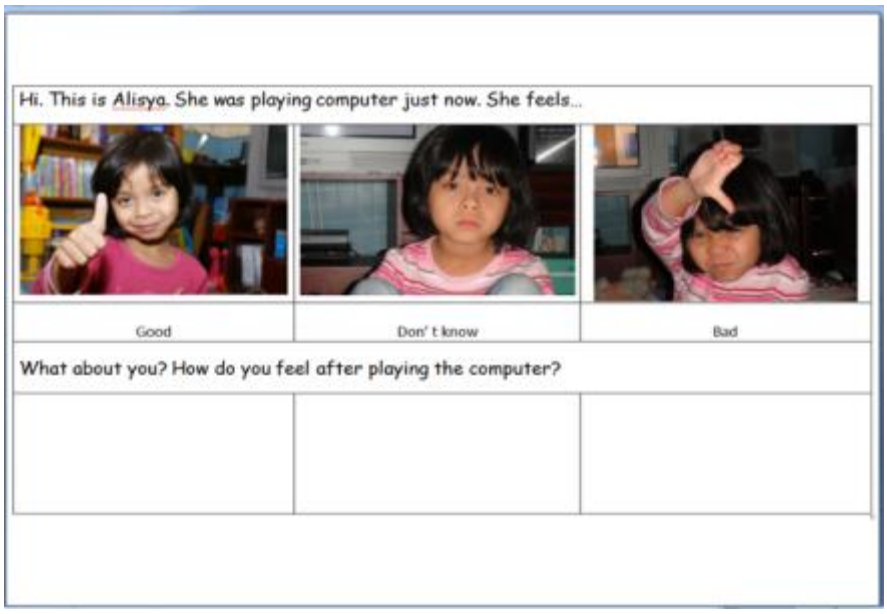


Figure 3.6*: Alisya* Feelings Toolkit

Then, the researcher observed young children using the Feelings Toolkit in a series of exploratory sessions conducted in the same nursery and in the home environment. Based on feedback given by parents, the researcher validated the existing Feelings Toolkit. The researcher conducted a validation study of the existing Feelings Toolkit with older children in Malaysia. Finally, the researcher produced a final version of the Feelings Toolkit (Figure 3.7 and Figure 3.8). Details of the Feelings Toolkit development process will be explained in Chapter 4.

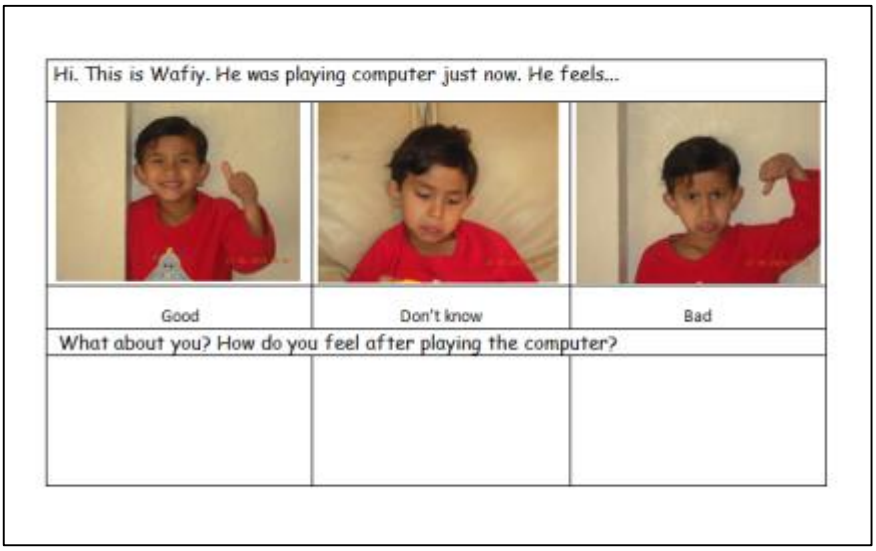


Figure 3.7*: Wafiy* Feelings Toolkit (1 sheet) - Final version

Figure 3.8*: Alisya* Feelings Toolkit (1 sheet) - Final version

3.3.4 Summary

Young children are a special category of computer users nowadays that need a specific evaluation technique to express their feelings towards computer products. The researcher developed the Feelings Toolkit for use with and by very young children using an iterative design approach and children's participation. Very young children in a local nursery in the UK participated in testing the tool. Besides, they also participated in using the tool in a series of exploratory sessions conducted in the nursery and at home. Older children in Malaysia

participated in validating the existing Feelings Toolkit. Finally, a final version of the Feelings Toolkit was produced.

The researcher continued evaluating the efficacy of the Feelings Toolkit in the evaluation phase. The evaluation phase is explained in the next section.

3.4 Evaluation Phase

Evaluation is defined by Markopoulos et al. (2008) as activities of providing feedback and guidance to interaction design, while Preece et al. (2002) define evaluation as a systematic data collection process regarding four aspects: what, who, why, and where, i.e. about what it is like for a specific user(s) to use a product for a specific task in a specific environment. The researcher conducted a user study in Malaysia to evaluate the efficacy of the Feelings Toolkit. Malaysian children in a nursery and at home evaluated the Feelings Toolkit after interacting with less-fun and fun computer products (edutainment courseware). Details of the evaluation study will explained in chapter 5.

How did the researcher involve very young children in the evaluation phase? The children's participation in the evaluation phase is explained in the next section.

3.4.1 Children's Participation in Evaluation Phase

In the evaluation phase as well, the researcher involved very young children as in rung four (assigned but informed) of Hart's Ladder of Participation (Hart, 1997). In the user study conducted in Malaysia, very young children in kindergarten and very young children at home participated in evaluating the efficacy of the Feelings Toolkit (see Section 5.2).

The researcher assigned a task for each child to play with edutainment courseware, to choose one version of the Feelings Toolkit they liked most, and to answer questions about their feelings after playing on the computer. Before that, the researcher informed the children about herself, the study, and the tool. They were informed that they were assisting in the development of a tool that would be used, in future, to evaluate feelings in children. The data gathered from the children's participation in the evaluation phase is explained in the next section.

3.4.2 Data Gathering: Techniques

In HCI, there are many data-gathering techniques available and triangulation is normally used, which means combining techniques. Asking the user is a way of obtaining feedback and can be done through interviews and questionnaires (Preece et al., 2002). Asking children and not an expert is the researcher's focus because she believes that children are the best people to voice their opinions when it comes to evaluating children's computer products. They have their own needs and opinions.

Basically, in the evaluation phase, the researcher asked about very young children's feelings using the new evaluation tool and observed how they responded to the tool. According to Markopoulos et al. (2008), there are two types of observation: direct and indirect. The difference is that the observer handles direct observation through watching participants and listening to them, while indirect observation requires automated technology like recoding and logging data using an audio video medium. The researcher used direct observation by taking notes of the children's behaviour and recording their answers when they were responding to the evaluation tool. This is cheaper and more practical since the studies were conducted in the children's natural settings, i.e. kindergarten and home.

Both techniques provided rich data for evaluating the new evaluation tool, such as data on children's feelings, their comments about the computer products used in the user study, and how they responded to the tool. The procedures involved in the evaluation session are explained in the next section.

3.4.3 Evaluation Procedures

In this study, evaluation procedures are activities done sequentially from the beginning until the end of an evaluation session. The main goal is to smooth the evaluation session to become a guideline to be followed in conducting the user study in the evaluation phase with very young children. The procedures to evaluate the efficacy of the Feelings Toolkit in a kindergarten and in home environments are listed below:

In round 1: please use Feelings Toolkit labelled with number 1

1. Ask child to play with Courseware1 for 2-3 minutes.
2. Show both versions of Feelings Toolkit (W1 and A1) to the child and ask the child which one he/she liked most.
3. Read an introductory statement: "Hi. This is Wafiy/Alisya (either one). He/she was playing on the computer just now. He/she feels..."
   "Good" "Don't know" "Bad"
   (While saying those words, I pointed to the related pictures as well).
4. Then ask the child a question: "How do you feel after playing on the computer"?
5. Point to each picture and say the feelings → start with "Good", "Don't know", and "Bad".
6. Write all responses shown/said by the child in a related box (below).

In round 2: please use Feelings Toolkit labelled with number 2

1. Ask the child to play with Courseware2 for 2-3 minutes.
2. Show both versions of Feelings Toolkit (W2 and A2) to the child and ask the child which one he/she liked most.
3. Read introductory statement: "Hi. This is Wafiy/Alisya (either one). He/she was playing on the computer just now. He/she feels..."
   "Bad" "Don't know" "Good"
   *THIS TIME, REVERSE THE ANSWERS; START WITH "BAD", "DON'T KNOW", AND "GOOD".
   (While saying those words, I pointed to the related pictures as well).
4. Then ask the child a question: "How do you feel after playing on the computer"?
5. Point to each picture and say the feelings → start with "Bad", "Don't know", and "Good".
6. Write all responses shown/said by the child in a related box.

Before conducting the user study in the home environment, the researcher briefed parents to let the participants have two rounds to play with the courseware; one courseware in each round. For each round, the parents first let their child play with the courseware for 2–3 minutes. Then, the parents showed both Feelings Toolkit versions to the participant and let them choose the Feelings Toolkit of interest to them. Then the parents read the introductory statement as stated in the Feelings Toolkit, followed by the required question as instructed in the sheet, and recorded the answer. After round 1 was completed, the parents and children repeated the same processes for round 2 with the other courseware.

3.4.4 Data Analysis

In the kindergarten, the researcher recorded data using an answer sheet (see Appendix E) because it involved many participants, and coded the data into Microsoft Excel. At home, the parents recorded the data in the evaluation tool itself. Once completed, the data was submitted to the researcher. The researcher then coded the data into Microsoft Excel. In Chapter 5, the researcher summarises the findings of the user study conducted in Malaysia to evaluate the efficacy of the Feelings Toolkit.

3.5 Summary

A research methodology for developing a new evaluation tool for very young children was followed. The methodology is divided into three phases: initial, development, and evaluation. Each phase has it owns activities and methods.

In the initial phase, the researcher reviewed related literature and conducted a preliminary study in two different environments; at a nursery and at a primary school. The findings of the preliminary study were used to make an important decision about place/context and the age group of the children to research with. The researcher decided to conduct the research in a local nursery in Glasgow, UK with children aged 3 to 5 years old.

In the initial phase, the researcher learned that conducting research with very young children (nursery age) was not easy and is very rarely done, as people are aware of the difficulties and challenges. But the opportunities and gap are still big. Very young children are exposed to computer technology as early as 3 years old by parents, teachers, and media at home or in school - in fact, everywhere. They are a special category of computer users. However, children's computer products are developed by adults and from an adult perspective. As known, very young children have their own wants and needs. Therefore, it is crucial to develop a usable and enjoyable product from children's perspectives.

In the development phase, the researcher developed a new evaluation tool, named the Feelings Toolkit, with young children's participation. The tool development applied an iterative design approach which involved designing–testing–redesigning of the tool. This iterative process can be divided into six stages (Stages 1 to 6). In Stages 1 to 6, the researcher involved children as in rung four (assigned but informed) of Hart's Ladder of Participation (Hart, 1997). The researcher

designed the Smiley Feelings Toolkit, Pictorial Feelings Toolkit, *Wafiy* Feelings Toolkit, and *Alisya* Feelings Toolkit and tested all the designs with very young children in a local nursery in the UK. Then a series of exploratory sessions were conducted in the nursery and in the home environment. Older children in Malaysia validated the existing Feelings Toolkit. Finally, the Feelings Toolkit was produced.

In the development phase, the researcher learned that very young children can use the new evaluation tool, which was designed using photographic representation and bipolar adjectives.

In the evaluation phase, the researcher evaluated the efficacy of the evaluation tool involving very young children as in rung four (assigned but informed) of the Ladder of Participation. The researcher asked about very young children's feelings after interacting with computer products using the new evaluation tool and observed how they used the tool. Procedures to conduct the user study to evaluate the Feelings Toolkit's efficacy in a kindergarten and in home environments were followed. In the kindergarten, the researcher recorded data using an answer sheet because it involved many participants, and coded the data into Microsoft Excel. At home, parents recorded the data in the evaluation tool itself.

In the evaluation phase, the researcher learned that the Feelings Toolkit, a paper-based evaluation tool that was developed for very young children aged 3 to 5, can assist them in expressing how they feel after playing with computer products.

Details of the development of the Feelings Toolkit are explained in chapter 4.

CHAPTER 4

DEVELOPING THE FEELINGS TOOLKIT

4.1 Introduction

This chapter describes the process of developing a new evaluation tool for very young children. This starts with the design and testing of the Smiley Feelings Toolkit, design and testing of the Pictorial Feelings Toolkit, design and testing of the *Wafiy* Feelings Toolkit, design and testing of the *Alisya* Feelings Toolkit, conducting exploratory sessions to learn about children's reactions to using the Feelings Toolkit in the UK, and finally validating the existing Feelings Toolkit.

4.2 Feelings Toolkit Background

The Feelings Toolkit was developed in six stages (Figure 4.1). The final Feelings Toolkit has two versions that are based on gender, a boy (*Wafiy* Feelings Toolkit) and a girl (*Alisya* Feelings Toolkit). Therefore, children have an option to choose whichever Feelings Toolkit version that they like, either a boy or a girl version.

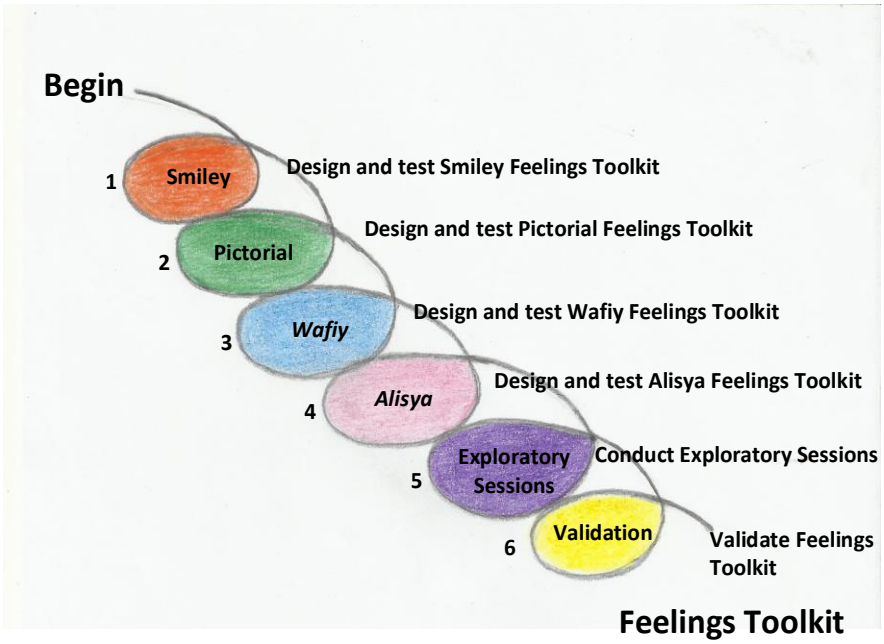


Figure 4.1: Development stages of the Feelings Toolkit

The next section describes details of the methodology used to develop the Feelings Toolkit.

4.2.1 Stage 1: Design Smiley Feelings Toolkit

The Smiley Feelings Toolkit is a new evaluation tool developed for use with and by very young children aged 3 to 5 years old to elicit their feelings towards computer products (Figure 4.2). The Smiley Feelings Toolkit was designed using three representations; smiley emoticons, bipolar adjectives, and a 5-point rating based on Likert scales.

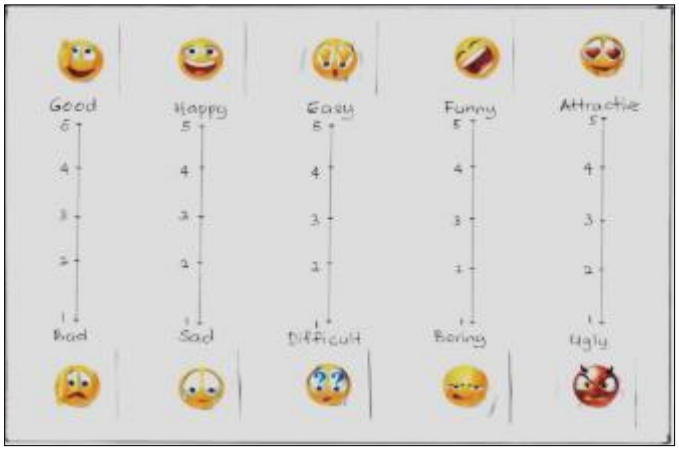


Figure 4.2: Smiley Feelings Toolkit – Early version (same as Figure 3.3)

Several questions are identified at this stage of activity:

Q1: Is the smiley representation simple and intuitive for very young children?
Q2: Are bipolar adjectives appropriate for very young children?
  S-Q1: How many adjectives are appropriate?
  S-Q2: Which adjectives are useful?
Q3: Are Likert scale ratings easy for very young children?
Q4: How is the Smiley Feelings Toolkit used by very young children?
Q5: Is the Smiley Feelings Toolkit appropriate for very young children to elicit their feelings?

The smiley emoticon was chosen as it is basic, nice-to-see, straightforward, and can be visualized by the children, and smiley characters have been used successfully for older children (Read and MacFarlane, 2006). The bipolar adjectives were adapted from the Semantic Differential technique because they can be used to measure the meaning of concepts or objects (see Section 2.5.3). In this research, the feeling among very young children after interacting with computer products was to be evaluated. The adjectives can be used in a rating process to

measure the feelings associated with attitude (Pearson and Bailey, 1980). Combining smiley emoticons and adjectives to represent feelings was expected to make it easy for very young children to understand the tool and to use it.

The 5-point Likert scale ratings are used in the Smileyometer (Read, 2008). Likert scales can be used to measure opinions, attitudes and beliefs by using statements representing a range of possible opinions (Sharp et al., 2011). In designing the Smiley Feelings Toolkit, the 5-point Likert scale with the bipolar adjectives was used to provide an easy/intuitive way for very young children to use the tool. The children could easily circle their answers on the scales. However, no statement representing possible opinions was visibly placed in the Smiley Feelings Toolkit. This was because not all the very young children could read text very well, although some could.

The design process was done using the throwaway prototyping approach. In February 2010, the Smiley Feelings Toolkit prototype was designed on paper because a paper-based prototype is very quick and cheap to build and very effective to identify problems in the early design stage (Sharp et al., 2011).

The process started with listing five bipolar adjectives and searching for representative smiley emoticons that could be used to evaluate feelings after very young children interact with computer products. Only five bipolar adjectives were chosen because young children should not be overloaded with too many different concepts, as suggested by Barendregt et al. (2008). Less information on the tool makes it much easier for very young children to recognise differences in the emotions. It is expected that they can easily understand and use the tool. The adjectives chosen were *good-bad*, *happy-sad, easy-difficult, funny-boring,* and *attractive-ugly*. Five different pairs of smiley emoticons representing these emotions were printed in colour, mapped to the emotions, cut, arranged, and pasted on an A4 sheet. Each pair of smiley emoticons appeared vertically from bottom to top on an A4 sheet with the Likert rating scales 1-5 and labelled with text accordingly (Figure 4.2).

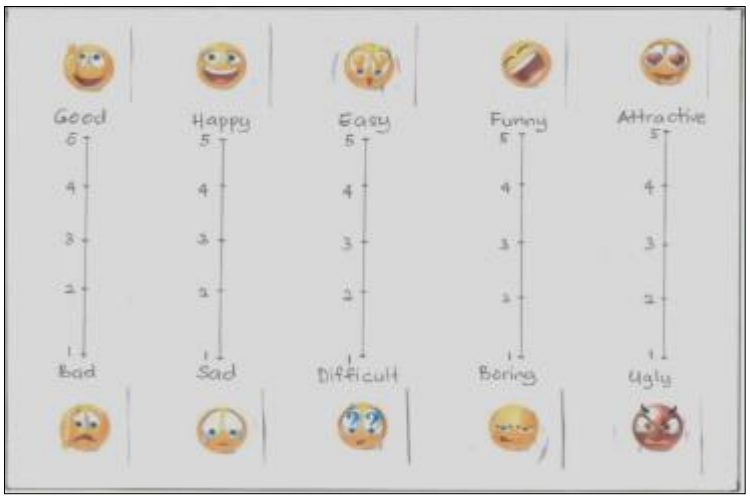


Figure 4.2: Smiley Feelings Toolkit – Early version (same as Figure 3.3)

To use the Smiley Feelings Toolkit, it is recommended that the facilitator sits beside the participant, holds the tool, and shows the tool first to the participant. The facilitator can use her fingers or hands to explain the rating scales because not all very young children have the ability to understand numbers. For example, the facilitator shows the Smiley Feelings Toolkit sheet and asks the participant: *"How good do you feel after interacting with the computer?"* and using her fingers to display the numbers: *"Is it 1-good, 2-good, 3-good etc.?"*. Then the facilitator asks the child to circle the related numbers.

Besides, the evaluator can also use her hands to show differences of each number and simultaneously saying "this much". Then the facilitator can pass the Smiley Feelings Toolkit sheet and ask the child to circle any numbers that represent their emotions. It is highly recommended that the facilitator provide a colourful, big and nice pen or pencil for very young children during the evaluation session to make the session interesting and fun. But an explanation must be given first to the children before asking them to answer on the sheet.

4.2.1.1 Test of Smiley Feelings Toolkit

A study was conducted in March 2010 at a nursery in Glasgow, UK (Section 3.2.3.1 describes the nursery background) with two objectives: to observe how children use the Smiley Feelings Toolkit and to identify the appropriateness of the tool to elicit feelings among very young children. Only four children voluntarily participated in the study.

The CBeebies website was used as a platform because it is based on a popular children's TV channel in the UK (see Section 3.2.3.3). Most children watch the CBeebies TV channel at home and are familiar with the website. The study was conducted in room 1 using two computers

connected to the internet. The reasons for using two computers were as a strategy to get more children participating in the study and as a strategy to organize the children's turns. Based on the researcher's experience of conducting a preliminary study in the nursery (see Section 3.2.3), some children did not like to wait long for their turn to play on the computer.

A second study was conducted in April 2010 at the same nursery using the same study plan. But a new platform was used in this study, Maths Circus Act 1 software. This was because the researcher wanted to test the Smiley Feelings Toolkit with another computer product. This maths software was pre-installed on the nursery's computer and was selected because it was not permitted to install software from outside. Figure 4.3 shows a screenshot of the maths software.

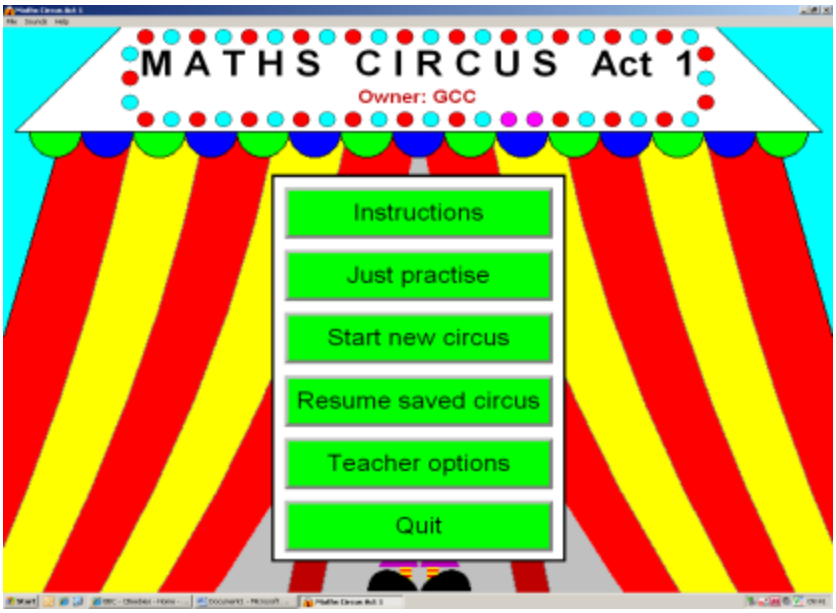


Figure 4.3: A Screenshot of the maths software

Maths Circus Act 1 is a mathematical computer game based on a puzzle concept using a circus theme. It was first published in 1993 on floppy disk for Disk Operating Software (DOS) and BBC but is now available for Windows and Macintosh. The original Maths Circus Act 1 and the next version, Act 2 are still being used in thousands of schools around the world. The latest versions are Act 4 and 5. The software has 12 puzzles and five levels of difficulty for each and it is based on the Ontario Curriculum.

During the study, not all participants wanted to play with the maths software because they were not familiar with the games. Six children voluntarily participated in the study. However, only two children played with the maths software. The other children played on the CBeebies website. Most children are familiar with the CBeebies website but not all children know the maths software. They were not forced to play the maths software because the study was planned

to be conducted naturally in the nursery environment. Besides, from a discussion with the staff, the researcher understood that children should be allowed to play with anything that interests them. The study continued and all the six participants completed the testing session.

4.2.1.1.1 Procedures

The procedures applied in the studies were adapted from the procedures described in Section 3.2.3.4, except that the drawing activity was taken out because very young children have difficulty in drawing, as summarised in Table 3.6 (see Section 3.2.3.5). Besides, the ten open and closed questions in Section 3.2.3.4 were not asked here because a new evaluation tool, the Smiley Feelings Toolkit was used in this testing. The studies comprised five main activities: greet the children, introduce the researcher, ask the child to play with/explore the computer product for 5 minutes, and finally show the Smiley Feelings Toolkit, ask questions and explain the rating scales, and pass the sheet with a pencil to the participant.

Each child who participated was greeted and introduced to the researcher and the study. *"Hello. I am XYZ. Do you want to play on the computer? I will ask you a few questions after playing on the computer*". The participant was asked to sit on a chair in front of the computer. In the first study, they were allowed to choose a game from the CBeebies website and play the game for 5 minutes. In the second study, they were allowed to choose any game from the Maths Act 1 software and play the game for 5 minutes.

Then researcher sat down next to the participant, held, and showed the Smiley Feelings Toolkit. The question was asked and the Likert scale was explained. Section 4.2.1 explains how to use the Smiley Feelings Toolkit. The researcher used her fingers and/or hands to explain the scale. The Smiley Feelings Toolkit sheet and a pencil were given to the participant. The participant was asked to circle any numbers 1-5 on *good-bad* smiley emoticons to represent how they felt after playing the game, in effect selecting the number that was most similar to how they felt. This was repeated for the four semantic differentials in the Smiley Feelings Toolkit. After the testing, the participant was thanked and given a high-five.

4.2.1.1.2 Findings

The findings from testing the Smiley Feelings Toolkit are discussed in two aspects: the appropriateness of the Smiley Feelings Toolkit to elicit feelings and the use of the Smiley Feelings Toolkit by very young children. The appropriateness of the Smiley Feelings Toolkit is discussed in three aspects: smiley emoticon representation, adjectives chosen and used, and also the Likert scale ratings.

Q1: Is the smiley representation simple and intuitive for very young children?

The smiley emoticon representation used in the Smiley Feelings Toolkit was not straightforward and not easy for some of the very young children. The smiley characters have been used successfully with older children but for very young children that particular representation was quite complicated and abstract. Only a few smiley emoticons like *good-bad, happy-sad,* and *funny* were easily recognised by the very young children in the testing. Some children had difficulties in recognising certain smiley emoticons; *easy-difficult, boring,* and *attractive-ugly*. Furthermore, some children misinterpreted the *attractive* smiley emoticon as *nice* and the *ugly* smiley emoticon as *evil.* Besides, one child asked about the meaning of *attractive.*

The emoticons used in the Smiley Feelings Toolkit could not assist very young children to understand the meaning of those particular feelings. Therefore, smiley emoticon representation is not suitable to use in designing a new evaluation tool to elicit very young children's feelings towards computer products. Some other representation which is simpler and more intuitive for very young children is needed in redesigning the Feelings Toolkit.

Q2: Are the adjectives appropriate for very young children?

The appropriateness of the adjectives was tested in two ways: the numbers of adjectives used and meaningful adjectives for very young children.

S-Q1: How many adjectives are appropriate?

Five pairs of adjectives were chosen and used in the Smiley Feelings Toolkit. This was too many for some children. Not all of the children answered all the questions. Some children answered certain questions only. For example, one child could only answer two questions (*good* and *happy*) and one child could answer three questions (*good, happy,* and *funny*). Fewer adjectives should be used in redesigning the new Feelings Toolkit so that very young children can answer all the questions.

S-Q2: Which adjectives are meaningful?

Most children can understand certain adjectives such as *good-bad* and *happy-sad.* Many children could not understand adjectives like *easy-difficult* and *attractive-ugly* in the Smiley Feelings Toolkit. For example, one child managed to answer confidently three questions by pointing her finger to *good, happy,* and *funny* smiley emoticons, but could not decide an answer for question 3 (*easy-difficult*). Therefore, the child nodded her head to both smiley emoticons that represented *easy-difficult*. Furthermore, she did not respond to *attractive-ugly* smiley emoticons as she did not understand their meaning. Meaningful adjectives for very young

children should be chosen when redesigning the new Feelings Toolkit, for example *good-bad* and *happy-sad*.

Q3: Are Likert scale ratings easy for very young children?

Many children had difficulty in understanding and using the 5-point Likert scale ratings. Only one child understood the Likert scales and answered all the questions using the rating scales. The child rated 5 for all the bipolar adjectives. But the child verbalised the number 5 instead of circling the number on the sheet using the given pencil. One child did not understand the numbers used in the Likert scales, and wrote and verbalised two different numbers when answering a question. The Likert scale rating which uses numbers was not suitable for some of the children because it was not easy for them to understand it. Besides, one child did not yet have a correct understanding of the concept of numbers.

The Likert scale rating was too advanced to be used in designing an evaluation tool for very young children, so other scales should be used as very young children need a simple way to interact with the Feelings Toolkit.

Q4: How is the Smiley Feelings Toolkit used by very young children?

Children used the Smiley Feelings Toolkit in more ways than expected. Some children ticked near to the smiley emoticons, verbalised words, nodded their head or pointed to relevant smiley emoticons. For example, one child ticked near to all the positive smiley emoticons and one negative smiley emoticon (*difficult*) and also circled the number 5 for the *good-bad* adjective (Figure 4.4). The child also nodded his head when question 3 (*easy-difficult)* was asked by the researcher.

Figure 4.4: A child answered using the Smiley Feelings Toolkit

One child pointed to all the positive smiley emoticons and used a pencil to write down his name on top of the sheet. Some children verbalised only certain adjectives such as *good*, *happy*, and *funny*. One child verbalised all the answers by saying *"this much"* and imitating the researcher's gestures while explaining the rating scales. Mostly the children could not circle the rating scales to answer the questions in the Smiley Feelings Toolkit and used other methods than circling the related numbers when interacting with the Smiley Feelings Toolkit.

Asking very young children to circle the evaluation tool is not suitable. Another technique must be applied when redesigning the new Feelings Toolkit and testing it with very young children to identify the appropriateness.

Q5: Is the Smiley Feelings Toolkit appropriate for very young children to elicit feelings?

One child inconsistently used the Smiley Feelings Toolkit. She pointed her finger at some smiley emoticons, *good* and *happy* but was stuck when answering question 3 (*easy-difficult*). The researcher asked and explained to her: *"How easy do you feel? Is it 1-easy, 2-easy, 3-easy..."?* She verbalised the answer "five", but she wrote number 0 near to the *difficult* smiley emoticon. She also marked unclear things in the Smiley Feelings Toolkit sheet which were identified by the researcher as *5, S, E*. She did not answer question 5 because she did not understand the meaning of *attractive*. It seemed that the Smiley Feelings Toolkit is not

straightforward and confuses the child interacting with it. It is not appropriate for very young children to express their feelings because it is difficult to understand and use.

4.2.1.2 Outcome of Stage 1

The responses and feedback gathered from testing the Smiley Feelings Toolkit were compiled and were regarded as the input for stage 2:

1. A representation other than the smiley emoticon that is simpler and more intuitive for very young children should be used in redesigning the Feelings Toolkit.
2. Other scales should be used when redesigning the Feelings Toolkit, as very young children need a simple way to interact with it.
3. Fewer meaningful adjectives which can be used to evaluate feelings should be chosen when redesigning the new Feelings Toolkit.
4. Another technique for asking for answers from children (interacting with the tool) must be applied when redesigning the new Feelings Toolkit and tested with very young children to identify their suitability.

Very young children need a simple and easy evaluation tool to use to evaluate feelings after interacting with computer products. A new tool should be designed using the outcome of Stage 1.

4.2.2 Stage 2: Design Pictorial Feelings Toolkit

The Pictorial Feelings Toolkit is another new evaluation tool that was designed to overcome the problems of the Smiley Feelings Toolkit (Figure 4.5). The problems discovered during the testing of the Smiley Feelings Toolkit were discussed in the previous Section. Another problem identified by the researcher was that the Smiley Feelings Toolkit does not have any visible question on it, so it might lead to confusion for the evaluators and users. They might use the tool differently from how it was originally designed.

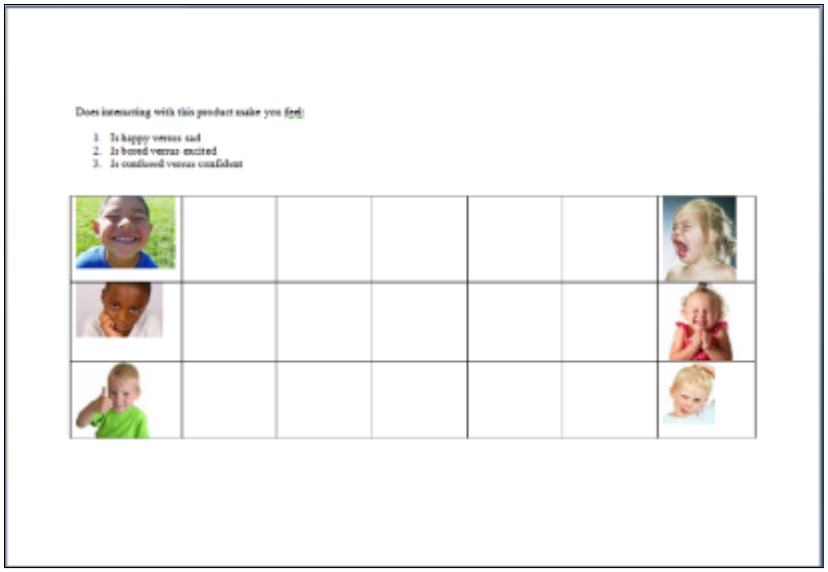


Figure 4.5: Pictorial Feelings Toolkit - Early version (same as Figure 3.4)

Several questions are identified at this stage of activity:

Q1: Is photographic representation simple and intuitive for very young children?

Q2: Is the Semantic Differential technique easy for very young children?

S-Q1: Which adjectives are useful?

S-Q2: Are empty boxes representing scales easy?

Q3: How is the Pictorial Feelings Toolkit used by very young children?

Q4: Which Feelings Toolkit is preferred by very young children: Pictorial Feelings Toolkit or Smiley Feelings Toolkit?

The Pictorial Feelings Toolkit was designed using two main principles: photographs and Semantic Differential scales. The outcome of Stage 1 in Section 4.2.1.2 was followed. Photographic representation was chosen because it is easy, simple, and intuitive for very young children, with reference to the outcome of Stage 1 and with reference to the Oucher tool (see Section 2.5.1). Besides, the work of Székely et al. (2011) and Widen and Russell (2016) proved that very young children can recognise emotions in photographs. The photographs chosen have to cover the feelings that children may have when they really enjoy/have fun interacting with computer products, as suggested by Barendregt et al. (2008). The Semantic Differential scales which can be used to measure emotions were chosen (see Section 2.5.3). Three bipolar adjectives and five empty boxes for children to express their feelings were used. Besides, a question asking about the children's feelings was placed at the top of the Pictorial Feelings Toolkit to guide the facilitator in asking and explaining the question to very young children when conducting the evaluation session.

The process of redesigning the Pictorial Feelings Toolkit was fast and cheap because it used a paper-based prototype, like the process of designing the Smiley Feelings Toolkit. Three pairs of bipolar adjectives were listed: *happy-sad, bored-excited, and confused-confident.* Six different photographs representing each of the emotions were identified and mapped accordingly. All the photographs were placed on an A4 sheet and five empty boxes were provided in the middle of each pair of photographs, which is adapted from the Semantic Differential technique (Figure 4.5).

The five empty boxes mean five scales are available to be chosen; two positives, one neutral, and two negative, e.g. *very happy, happy, don't know, sad,* and, *very sad.* The original Semantic Differential requires the user to put a cross (X) in a blank space between a pair of adjectives. But the Pictorial Feelings Toolkit requires users who are very young children to tick the empty boxes between a pair of photographs.

The closest box to each photograph represents either positive or negative emotion. For example, the photographs in the first row are *happy* versus *sad,* in the second row are *bored* versus *excited* and in the last row are *confident* versus *confused*. The positive and negative photographs were organised not in a normal sequence and purposely mixed so that positive and negative attributes are distributed on the right and left sides. This can serve as a control mechanism to avoid children simply answering all the questions in the Pictorial Feelings Toolkit. Besides, it avoids the children answering all the questions positively just to please the researcher.

There is one question at the top of the sheet asking the children about their feelings after interacting with computer products: *"Does interacting with this product make you feel:"* followed by three answers asking for the children's feelings:

1. *Is happy versus sad*
2. *Is bored versus excited*
3. *Is confused versus confidence*

The question is important for the facilitator to start asking the children in the evaluation session. To use the Pictorial Feelings Toolkit, the children have to tick one box in each row that represents their feelings. Explanation or assistance from the facilitator is important, reading the question first and explaining the scales before giving the tool for the children to tick their answer.

4.2.2.1 Test of Pictorial Feelings Toolkit

Testing of the Pictorial Feelings Toolkit was conducted with children at the same nursery. A series of studies was conducted on two days in April 2010 at the nursery. The objectives of the studies were to identify the suitability of the photographs and Semantic Differential scales used in the Pictorial Feelings Toolkit, to observe nursery children using the Pictorial Feelings Toolkit, and to identify the children's preferred tool between the Pictorial Feelings Toolkit and the Smiley Feelings Toolkit. Eight children participated in the first study but three participants took part in only half. Five children participated in the second study but three participants took part in only half. The total participants were only seven.

4.2.2.1.2 Procedures

The same procedures for testing the Smiley Feelings Toolkit as in Section 4.2.1.1.1 were applied in testing the Pictorial Feelings Toolkit. The researcher first greeted the children, introduced herself and the study, allowed them to choose and play with any computer products they liked, on either the CBeebies website or Maths Circus Act 1 software, asked them to choose either the Smiley Feelings Toolkit or the Pictorial Feelings Toolkit that they liked most, and showed the chosen tool, asked questions and explained the scales, passing the sheet with a pencil to the participant, and finally thanking the children for their participation.

The difference from the previous procedure was that the participant was asked to tick any empty box for the *happy-sad* photographs that represented how they felt after playing the game. If the participant chose the Smiley Feelings Toolkit, the procedures in Section 4.2.1.1.1 were applied and the child had to circle the related numbers. This was repeated for the other two Semantic Differential scales in the Pictorial Feelings Toolkit. The participant was thanked after the testing finished.

4.2.2.1.3 Findings

Q1: Is photographic representation simple and intuitive for very young children?

Most of the photographs used in the Pictorial Feelings Toolkit were understood by the children, but one child misinterpreted the *sad* photograph as a *cry* photograph. Most children responded well to all the photographs, but one child could not answer *confident* versus *confused* photographs. Based on the different ways children displayed in using the Pictorial Feelings Toolkit as discussed in Section Q3 later, the photographic representation is simple and intuitive for very young children. The photographic representation can be used in redesigning the new Feelings Toolkit.

Q2: Is the Semantic Differential technique easy for very young children?

The Semantic Differential technique applied in the Pictorial Feelings Toolkit was tested in two ways: adjectives chosen to represent the feelings, and empty boxes used to represent the scales.

S-Q1: Which adjectives are useful?

During the testing, simple adjectives for concepts like *happy, sad, excited* and *bored* were easily understood by all the children. However, two adjectives, *confused* and *confident,* could not be understood by some nursery children. For example, one child could answer all the questions except the last question, *confident* versus *confused*. Two bipolar adjectives, *happy* versus *sad* and *excited* versus *bored* were identified as useful in the Pictorial Feelings Toolkit. These particular adjectives can be used in redesigning a new Feelings Toolkit.

S-Q2: Are empty boxes representing scales easy?

The five empty boxes representing the scales in the Pictorial Feelings Toolkit were misused by one child. The function of the boxes as Semantic Differential scales was misunderstood and not straightforward for very young children. For example, a child tried to draw his own face in the box, as shown in Figure 4.6. The child also marked and drew unidentified objects in the three first boxes in the first row when answering question 1. Not all very young children can understand the empty boxes representation. The children failed to use the scales. The use of empty boxes to represent scales was not easy for very young children.

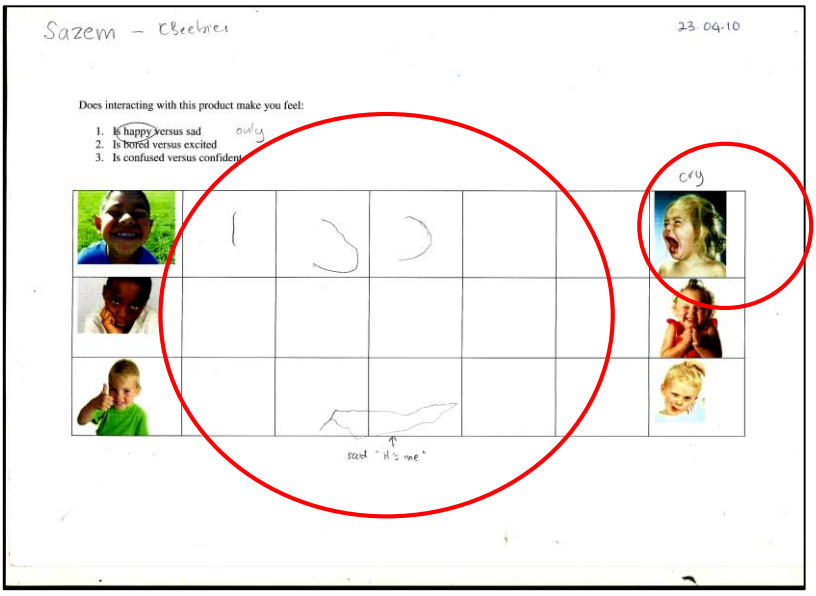


Figure 4.6: An answered Pictorial Feelings Toolkit

Q3: How is the Pictorial Feelings Toolkit used by very young children?

The very young children displayed different ways of using the Pictorial Feelings Toolkit. Two children managed to tick all the boxes near to the positive photographs and one child wrote down his name at the top of the sheet. The researcher helped another child to hold a pencil while the child answered on the Pictorial sheet.

One child chose to verbalise the answers after the explanation was given by the researcher. The child verbalised *happy* correctly but had difficulty verbalising *excited* correctly. One child displayed mixed methods when answering questions. He verbalised *sad* and also drew/marked unidentified objects in certain boxes. Obviously, not all very young children are able to tick the relevant boxes when answering the Pictorial Feelings Toolkit. Asking very young children to tick the Pictorial Feelings Toolkit was not suitable and inappropriate because some children had difficulties holding the pencil and understanding the tool. Another technique for asking very young children to interact with or use the evaluation tool must be used when redesigning the new Feelings Toolkit.

Q4: Which Feelings Toolkit is preferred by very young children - Pictorial Feelings Toolkit or Smiley Feelings Toolkit?

In the testing, three children preferred the Pictorial Feelings Toolkit and four children preferred the Smiley Feelings Toolkit. One child who chose and answered on the Pictorial Feelings Toolkit said that he liked the Smiley Feelings Toolkit as well. Five children who took part in only half the testing did not want to choose any tool. They played on the computer for a while but left the session without answering the questions. They were not forced to complete the testing as it was planned to be naturally conducted in the nursery environment. The studies conducted in the nursery to identify the preference between the Pictorial Feelings Toolkit and Smiley Feelings Toolkit did not provide enough data or a clear answer on the children's preferred tool because only seven children completed the testing.

Therefore, a definite conclusion about which tool was preferred could not yet be made. Interviews and discussions with the nursery staff were planned to get feedback and suggestions about the Pictorial Feelings Toolkit and the Smiley Feelings Toolkit. This was because the data gathered from the studies conducted with the nursery children were insufficient. During the testing of the Pictorial Feelings Toolkit and the Smiley Feelings Toolkit with the children, the preferred tool could not be clearly identified because only a small number of children took part. Five children left the testing without answering any questions. Besides, one child made an inconsistent choice and despite answering on the Pictorial Feelings Toolkit, also mentioned that he liked the Smiley Feelings Toolkit. Therefore, discussion and interviews were conducted to obtain feedback from the nursery staff.

4.2.2.2 Discussion and Interviews

Discussion and interviews were conducted to obtain feedback on the Pictorial Feelings Toolkit and the Smiley Feelings Toolkit from nursery staff because a definitive conclusion could not be made due to the insufficient data gathered from the studies conducted with the nursery children. The discussion with the nursery head teacher was held at the end of April 2010 while the interview with nursery staff was conducted in May 2010.

The objectives of the discussion with the head teacher and interviews with the nursery staff were to obtain opinions and feedback about the Pictorial Feelings Toolkit and Smiley Feelings Toolkit, to identify the preferred tool between the Pictorial Feelings Toolkit and the Smiley Feelings Toolkit among the nursery staff, to identify the suitability of the tools in terms of features and adjectives used, to understand the ways children respond to/use the tools, and to identify other suitable techniques that can be applied to evaluate feelings after very young children interact with computer products. The researcher did not ask the staff to use or test any versions of the Feelings Toolkit with the nursery children due to their time constraints and job limitations.

The objectives of this activity are as follows:

- O1: To obtain an overall/overview opinion about the Smiley Feelings Toolkit and Pictorial Feelings Toolkit.
- O2: To identify whether Pictorial Feelings Toolkit or Smiley Feelings Toolkit is preferred by nursery staff.
- O3: To identify very young children's ability to understand the tools.
- O4: To identify the suitability of the tools for very young children:
  - S-O1: Photographs - size, colour, quantity, and other.
  - S-O2: Feeling concepts or adjectives selection.
- O5: To understand ways in which very young children respond to or use the tools.
- O6: To identify other suitable techniques to use in evaluating feelings with and by young children after interacting with the computer.

4.2.2.2.1 Procedures

An appointment to discuss the Pictorial Feelings Toolkit and Smiley Feelings Toolkit was made with the head teacher. The discussion was done one-to-one at the head teacher's office with reference to the report prepared after conducting studies with the nursery children.

A working paper to interview the nursery staff was prepared and submitted to the nursery head teacher. The application was approved and the nursery named three staff to be interviewed, who

were English Additional Language (EDL) teachers. However, the researcher was asked to make individual arrangements to interview each of the staff based on their availability.

The interviews were conducted on two different days and at several times as agreed by each of the staff. The staff were working and handling the nursery children while the interview was conducted as they could not leave the children without supervision. Each staff member was interviewed in less than 20 minutes. They had a chance to look at and compare the tools before the discussion or interviews were held because both of the Feelings Toolkit versions were submitted earlier with the working paper. They were also aware of the research on very young children interacting with computer products being conducted by the researcher in the nursery since May 2009.

4.2.2.2.2 Findings

O1: To obtain an overall/overview opinion about the Smiley Feelings Toolkit and Pictorial Feelings Toolkit.

The strengths and weaknesses of the Pictorial Feelings Toolkit and Smiley Feelings Toolkit were gathered during the discussion and interviews with the nursery staff. The head teacher commented that both the Smiley Feelings Toolkit and the Pictorial Feelings Toolkit were only suitable for older children and both tools were not child-friendly for younger children because it was not easy for very young children to understand and use them. The head teacher also commented that asking children to answer on the tool by themselves was not suitable. It was not appropriate to ask very young children to circle or tick on the tool. Although the tool makes it easy for the researcher to collect data, it is difficult for very young children to answer.

Some staff thought that the Smiley Feelings Toolkit was not suitable for very young children because it used smiley emoticons to represent feelings which are not straightforward. Very young children need to understand the emoticons first and then to interpret the meanings before answering all the questions. They also commented that some smiley emoticons in the Smiley Feelings Toolkit were complicated, so very young children might misinterpret them. Furthermore, the Smiley Feelings Toolkit uses numbers to represent scales. According to some staff, not all very young children can understand numbers.

The weakness of the Pictorial Feelings Toolkit was identified during the interviews. The function of the five empty boxes as a Semantic Differential scale was unrecognised by one staff member, who perceived that children might draw in the boxes when answering the questions. A new version of the Feelings Toolkit should be designed to overcome the problems that were highlighted by the nursery head teacher and staff.

O2: To identify whether the Pictorial Feelings Toolkit or Smiley Feelings Toolkit is preferred by the nursery staff.

Most of the staff preferred the Pictorial Feelings Toolkit because it uses photographs, which are more personal, close and related to very young children. One staff member said that photographic representation is simple and clear to very young children. One staff member thought that very young children, particularly those who do not speak English as their first language, can understand the Pictorial Feelings Toolkit better than the Smiley Feelings Toolkit which uses smiley emoticons. The head teacher said the Pictorial Feelings Toolkit is better than the Smiley Feelings Toolkit because it uses photographs of children showing different facial expressions.

Generally, all the staff including the head teacher in the nursery preferred the Pictorial Feelings Toolkit to the Smiley Feelings Toolkit because it used photographic representation which was clear, simple, easy, and intuitive for very young children. Therefore, the new Feelings Toolkit will be designed based on the idea of using photographs as in the Pictorial Feelings Toolkit.

O3: To identify very young children's ability to understand the tools.

One staff member was confident that very young children can understand the tools if the researcher or adult gives an explanation first because each child has different ability to understand each tool due to different factors e.g. maturity and family education background. Another staff member believed that some smiley emoticons in the Smiley Feelings Toolkit like *happy*, *sad*, and *funny* can only be understood by older children because the symbols are not straightforward and need interpretation. Furthermore some smiley emoticons like *attractive*, *ugly* and *difficult* are too difficult for very young children to understand.

Very young children can understand the tools if an explanation is given to them. Children need a new evaluation tool which is not a self-reporting instrument. The new tool uses photographic representation as suggested by the nursery staff.

O4: To identify the suitability of the tools for very young children.

Most of the staff said that the Pictorial Feelings Toolkit is an appropriate evaluation tool for very young children. They gave positive and negative comments and also suggestions to improve the Pictorial Feelings Toolkit. Their suggestions focused on the photographic representation, particularly the size and number of photographs used. They also suggested reducing the Semantic Differential scale and selecting simple adjectives that can be used to evaluate feelings in very young children interacting with computers.

S-O1: Photographs size, colour, quantity, and other.

The head teacher commented that the six photographs displayed on the Pictorial Feelings Toolkit were too small and too many in number. One staff member also highlighted that there were too many photographs and images on both tools. They suggested that there should be bigger and fewer photographs. One staff member specifically suggested that three photographs per page of the Pictorial Feelings Toolkit is the maximum. Another staff member suggested changing a *sad* photograph in the Pictorial Feelings Toolkit because the existing photograph looked like a *crying* photograph which can mislead the children.

Not many staff commented on the colours used in the tools. Only one staff member said that both of the tools had nice bright colours which were good and reflected that the tools were designed for use with and by children. A new Feelings Toolkit will be designed using new photographs of one nursery-aged model presented in a new layout.

One staff member thought that the five scales used in the Pictorial Feelings Toolkit were too many for very young children and suggested using three scales to make it easier for very young children to understand and differentiate them. Another staff member disagreed with using numbers to represent scales as in the Smiley Feelings Toolkit because only a few very young children know and recognise numbers. The five empty boxes representing scales in the Pictorial Feelings Toolkit and the numbers 1 to 5 representing five-point Likert Scales in the Smiley Feelings Toolkit will not be used when designing the new Feelings Toolkit, as suggested by the staff.

S-O2: Feeling concepts or adjectives selection.

According to the staff, some of the feeling concepts or adjectives in the tools can be used to evaluate the feelings, particularly the simple concepts like *good, bad, happy, sad, excited,* and *bored.* But more sophisticated concepts like *attractive, ugly, confident* and *confused* cannot be used to evaluate feelings among very young children because they cannot understand them. One staff member said that some of the advanced feeling concepts used in the Pictorial Feelings Toolkit like *confident* and *confused* were vague to very young children. They had difficulty differentiating and understanding these adjectives. The staff member suggested replacing these concepts with simple ones like *good* and *bad.* Only simple feeling concepts or adjectives will be used when designing the new Feelings Toolkit.

O5: To understand ways in which very young children respond to or use the tools.

One staff member perceived that children might point their finger to relevant photographs in the Pictorial Feelings Toolkit or to the smiley emoticons in the Smiley Feelings Toolkit when

answering questions. Another thought that very young children might circle relevant numbers that represented their emotions on the Smiley Feelings Toolkit, while another thought the children might draw their own faces in the empty boxes in Pictorial Feelings Toolkit to show their responses. The head teacher thought the children would mark anywhere on both of the tools because they might perceive the tools as a chart on a piece of paper. Therefore the head teacher suggested using another way to get feedback from the children. But if the children need to use a pen or pencil to answer the tool, the head teacher suggested giving them a big and colourful pencil.

Children might use the tools in different ways according to their abilities. Some children can hold a pencil and circle numbers in the Smiley Feelings Toolkit, some children might write or draw unwanted things in both tools, and some children might point a finger to the relevant photographs or smiley emoticons. Some of these responses can make gathering data and analysing it later difficult and inaccurate. The new Feelings Toolkit will be designed so that children can easily interact with and use the new tool in a simple way, for example pointing their finger at related photographs.

O6: To identify other suitable techniques to use in evaluating feelings with and by young children after interacting with the computer.

The head teacher highlighted that the data collection technique used with very young children in the testing was not suitable. The head teacher suggested that asking children to answer on questionnaires should be changed to interviews, i.e. with the researcher asking questions and recording answers. It was not appropriate to ask very young children to write or mark something on paper. One staff member suggested that an observation technique can be applied while using the evaluation tool with very young children to obtain rich data, because children's body language/signals such as smiles and laughter can be seen and identified during the observation. The observation technique may be considered in conducting a study to test the new Feelings Toolkit with children.

4.2.2.3 Outcome of Stage 2

The new Feelings Toolkit will be designed based on the Pictorial Feelings Toolkit. Feedback, comments and suggestions from the children and staff at the nursery were compiled and were regarded as the input for stage 3:

(i) The new Feelings Toolkit must be representable and understandable to the children, for example using nursery-aged model photographs instead of other representations.

(ii) Larger photographs need to be shown so that very young children can easily point to the photograph that reflects their choice.

(iii) The new Feelings Toolkit should prioritise the ability of children to use the tool rather than the ability of the researcher to collect data. In the Feelings Toolkit this meant having scales which were easier for children to use, rather than more scales which give more precise data to the researcher; three scales are better.

(iv) Fewer scales are easier for children to recognise and differentiate.

(v) Advanced or sophisticated emotional concepts such as *confident* and *confused* cannot be understood by children.

Overall, the staff said that the Smiley Feelings Toolkit is not appropriate to use with and by very young children to evaluate feelings. The Pictorial Feelings Toolkit is more appropriate for very young children but needs modification. Therefore, a new version of the Feelings Toolkit will be designed based on the outcome of stage 2 as listed in Section 4.2.2.3 to overcome the problems identified in the Pictorial Feelings Toolkit.

4.2.3 Stage 3: Design of *Wafiy* Feelings Toolkit

The *Wafiy* Feelings Toolkit was designed based on the Pictorial Feelings Toolkit which all the nursery staff liked more than the Smiley Feelings Toolkit (see Section 4.2.2.3 - O2). They particularly liked the idea of using photographs in the Pictorial Feelings Toolkit, but suggested some modification to improve the ease of use of the tool among very young children. The *Wafiy* Feelings Toolkit used new photographs. The *Wafiy* Feelings Toolkit is named based on a boy's name (the model) who is aged 5 years old (Figure 4.7).

Figure 4.7: *Wafiy* Feelings Toolkit (same as Figure 3.7)

Permission to use the boy's photographs and name was granted by the child and parent in writing, as suggested by UNICEF:

"Obtain permission from the child and his or her guardian for all interviews, videotaping and, when possible, for documentary photographs. When possible and appropriate, this permission should be in writing. Permission must be obtained in circumstances that ensure that the child and guardian are not coerced in any way and that they understand that they are part of a story that might be disseminated locally and globally. This is usually only ensured if the permission is obtained in the child's language and if the decision is made in consultation with an adult the child trusts".

In Markopoulos et al. (2008), it is also accepted to use images of children as long as this is permitted by the child and a responsible adult, but with the condition that the child is clearly not stressed or doing anything that makes him/her look foolish.

In response to the statement by UNICEF and Markopoulos et al. (2008), this research follows all the recommendations.

Several questions are identified at this stage of activity:

Q1: Is photographic representation of one nursery-aged child simple and intuitive for young children?
  S-Q1: Is the photograph size suitable for very young children?

Q2: Is the new layout of the *Wafiy* Feelings Toolkit easy for very young children?
  S-Q1: Are three scales in the Feelings Toolkit easy for very young children?
  S-Q2: Is the layout of one bipolar adjective per sheet easy for very young children?
  S-Q3: Are the bipolar adjectives chosen easy for very young children?

Q3: How is the *Wafiy* Feelings Toolkit used by very young children?

Q4: What are the problems with testing the *Wafiy* Feelings Toolkit with very young children?

The *Wafiy* Feelings Toolkit was designed using photographs of a nursery-aged child with nine different facial expressions and hand gestures showing positive, neutral, and negative emotions and bipolar adjectives. The decision to use these photographs was made with reference to the outcome of Stage 2 (see Section 4.2.2.3). The use of photographs of a nursery-aged child was an attempt to make the evaluation tool intuitive for the children; by seeing photographs of children of the same age, the children could recognise which feeling was being described and indicate which was relevant to them. The new photographs used in the *Wafiy* Feelings Toolkit are bigger than those used in the Pictorial Feelings Toolkit with reference to the outcome of Stage 2,

making it easy for children to use the tool. The decision to choose three scales also followed the outcome of Stage 2 and was made with reference to one tool, Soremo (Girard and Johnson, 2009), as discussed in Section 2.5.2. Besides, the *Wafiy* Feelings Toolkit was designed with a smaller scale on each page. Only simple adjective concepts identified in the previous testing were chosen. The changes made were based on the outcome of Stage 2.

Each sheet of the *Wafiy* Feelings Toolkit contains medium-size photographs of the model displaying different feelings; one positive, one neutral, and one negative photograph organised from left to right (Figure 4.6). The photographs on each sheet show a child displaying the labelled feelings. The top of each sheet is introduced with *Wafiy's* name and the following statement: *"Hi. This is Wafiy. He was playing computer just now. He feels…"*, followed by relevant photographs with text labelled below it. At the bottom of each sheet is a question about the child's feeling: *"What about you? How do you feel after playing the computer?"* This is followed by three empty boxes to be filled by the facilitator once an answer is given by the child. Appendix F shows the complete version of the *Wafiy* Feelings Toolkit.

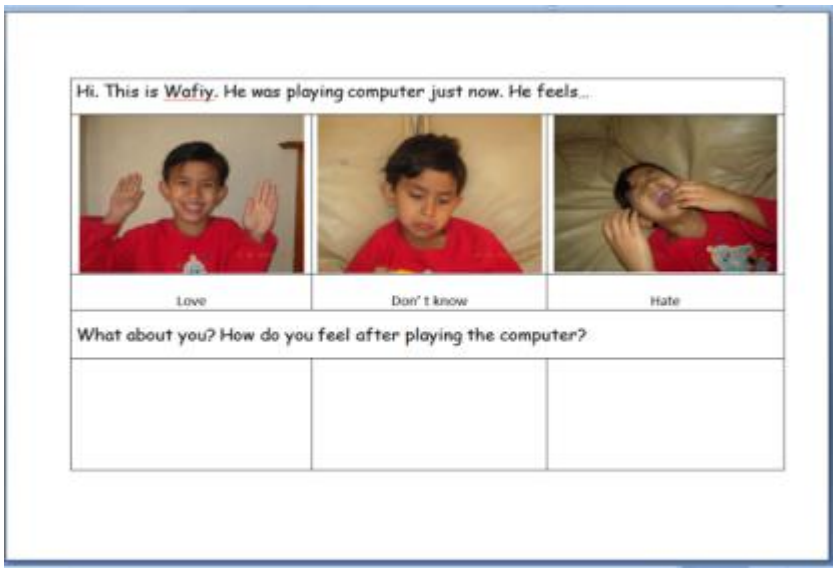


Figure 4.7: *Wafiy* Feelings Toolkit (same as Figure 3.7)

Only three scales were used when designing the *Wafiy* Feelings Toolkit. Different photographs that represented the feelings were used except for the neutral image, which used the same photograph. The neutral photograph, representing *Don't Know* was the same on each sheet. The positive and negative feelings were represented by different photographs of the model representing different feelings on each sheet.

Each sheet of the *Wafiy* Feelings Toolkit displayed one bipolar adjective (feelings); *happy-sad*, *good-bad*, *love-hate*, or *excited-bored*. Each of the feelings was represented by relevant

photographs and was labelled with appropriate feelings (Figure 4.6), in contrast to the Pictorial Feelings Toolkit, which displayed three bipolar adjectives and five scales on one A4 sheet (Figure 4.4). The Pictorial Feelings Toolkit has six photographs which contain too much information. The findings from testing the Pictorial Feelings Toolkit in Section 4.2.2.1.3 showed that some children had difficulty in focusing and answering all the Semantic Differential scales displayed in the Tool. The *Wafiy* Feelings Toolkit had fewer photographs per sheet.

Only four bipolar adjectives were chosen in the *Wafiy* Feelings Toolkit; *happy-sad, good-bad, excited-bored* and *love-hate*. Three bipolar adjectives were identified as useful when conducting testing of the Smiley Feelings Toolkit (see Section 4.2.1.1.2), the Pictorial Feelings Toolkit (see Section 4.2.2.1.3), and interviewing staff (see Section 4.2.2.2.2). The useful adjectives identified were; *happy-sad, good-bad,* and *excited-bored*. The adjectives *happy-sad* and *good-bad* were identified as useful in the findings of testing the Smiley Feelings Toolkit and the Pictorial Feelings Toolkit as discussed in Section 4.2.1.1.2 and Section 4.2.2.1.3 respectively, while the bipolar adjectives, *excited-bored,* were identified as useful in the findings from testing the Pictorial Feelings Toolkit (see Section 4.2.2.1.3).

New bipolar adjectives, *love-hate,* were used in designing the *Wafiy* Feelings Toolkit because they may be used to evaluate the feelings. The researcher wanted to ask children about *like-dislike* but had difficulty in taking or identifying suitable photographs and mapping them to those particular emotions. The closer meaning was chosen - *love-hate.*

Pointing a finger is one way of using the *Wafiy* Feelings Toolkit which was introduced to the children as suggested by Barendregt et al. (2008). The children could point to any related photographs that represented their feelings. Besides, the method was chosen because of the evidence from the testing of the Pictorial Feelings Toolkit (see Section 4.2.2.1.3 - Q3) that asking very young children to tick the empty boxes was not appropriate because some children had difficulty holding a pencil and writing on the paper. Asking children to circle was inappropriate, as discussed in the findings of testing the Smiley Feelings Toolkit (see Section 4.2.1.1.2 - Q4). Feedback given by one nursery staff member that children might point their finger was considered when designing the *Wafiy* Feelings Toolkit. The teacher said that children might point to relevant photographs in the Pictorial Feelings Toolkit or point to the smiley emoticons in the Smiley Feelings Toolkit when answering questions (findings in Section 4.2.2.2.2).

The process of designing the *Wafiy* Feelings Toolkit started with taking photographs. This was done at the model's home by his father. The model was asked to express specific facial

expressions and gestures but was not forced to do it. The photographs were taken over three days in May 2010. Hundreds of photographs were taken by the amateur photographer using a digital camera. The photographs were captured using software available in the Department of Computer and Information Sciences (CIS) at the University of Strathclyde, *IrfanView* (Figure 4.8).

Figure 4.8: Boy model's facial expressions and hand gestures in thumbnails

The process of selecting and mapping the relevant photographs into particular feelings was done. Only clear and relevant photographs were selected and displayed on four A4 sheets with three photographs per sheet displaying one pair of bipolar adjectives containing one positive feeling (*happy, good, love, excited*), one neutral feeling, and one negative feeling (*sad, bad, hate, bored*). Nine different photographs representing four positives, four negatives, and one neutral emotion were arranged in 5x3 tables on four sheets of A4 landscape-orientation page layout. The size of each photograph is 8 cm x 6 cm. The *Wafiy* Feelings Toolkit was printed on four sheets of white A4 paper using a colour printer.

Figure 4.9 shows one of the *Wafiy* Feelings Toolkit sheets used by a parent with her own child when the exploratory session was conducted in a home environment in the UK (see Section 4.2.5.3). The parent was informed by the researcher on how to use the *Wafiy* Feelings Toolkit with her child at home. The parent was asked to write answers, feedback, or any special remarks that she observed with her child while answering questions using the *Wafiy* Feelings Toolkit.

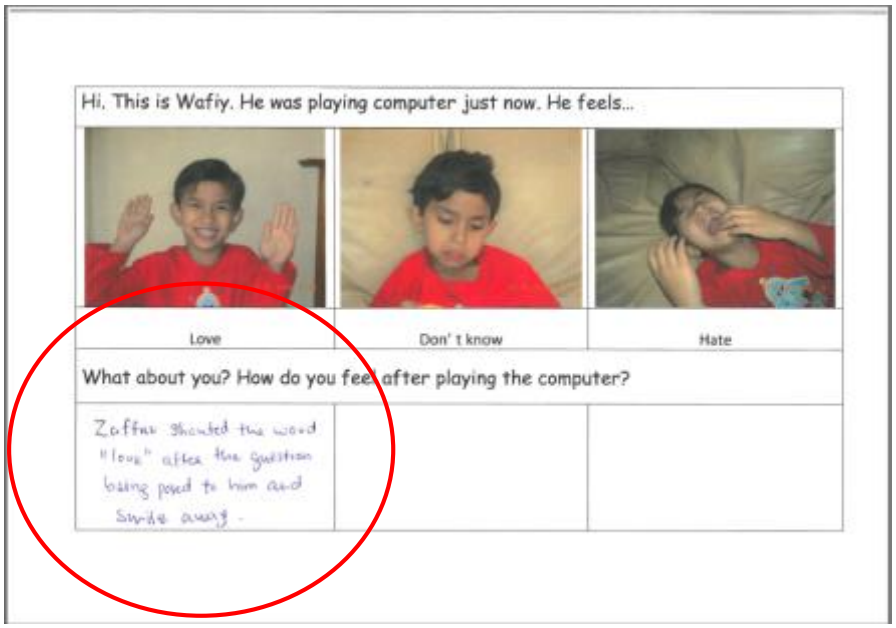


Figure 4.9: Parent wrote responses in the *Wafiy* Feelings Toolkit sheet when an exploratory session was conducted at home

4.2.3.1 Test of *Wafiy* Feelings Toolkit

The *Wafiy* Feelings Toolkit was tested in June 2010 with children at the same nursery. The objectives of the study were: to identify if the new photographs of a nursery-aged child are simple and intuitive, including the photograph size, to identify if the new layout of the *Wafiy* Feelings Toolkit is easy for very young children in terms of scale, layout, and bipolar adjectives, to observe how very young children use the tool, and to identify problems that occur when conducting testing of the *Wafiy* Feelings Toolkit with nursery children.

A series of studies was conducted over three days in June 2010. The studies were conducted in room 1 in the nursery using two computers. Each study started late and ended before 11.00am due to several constraints in the nursery. The first study started at around 10.15 am because there was a storytelling session for all the nursery children before that. The second study started around 10.25 am because some of the children were practising for their concert and graduation day to be held the following week and some children were playing outdoors. The final study started at around 10.15 am because some children were practising for their graduation day concert.

Only six children (three boys and three girls) participated in the studies because the nursery was busy with other activities. Two platforms were used in the testing, the CBeebies website and the mathematics software. Interviews and the observation technique were applied in the study as suggested by nursery staff (except the head teacher).

An informal interview was conducted with the same nursery staff as described in Section 4.2.2.2. However, the head teacher (acting) who was previously interviewed had left the nursery and there was a new permanent head teacher, who was briefed about the research but did not want to participate in the interview. The interview was done informally before the nursery closed for the long summer holidays. All the staff were busy with daily activities in the nursery including special end of term activities, i.e. graduation ceremony and concert.

4.2.3.1.1 Procedures

The same procedures for testing the Pictorial Feelings Toolkit as in Section 4.2.2.1.2 were applied in testing the *Wafiy* Feelings Toolkit. The researcher first greeted the children, introduced herself and the study, allowed them to choose and play with any computer products that they liked (CBeebies website or Maths Circus Act 1 software), showed the *Wafiy* Feelings Toolkit, asked questions and explained the tool, and finally thanked the children for their participation.

The differences were that neither a pencil nor the *Wafiy* Feelings Toolkit sheet was given to the participant and only one tool was used, the *Wafiy* Feelings Toolkit. First, the researcher showed the first sheet of the *Wafiy* Feelings Toolkit and read an introductory statement: *"Hi. This is Wafiy. He was playing computer just now. He feels..."*. Then the researcher pointed her finger to the *happy* photograph and said *"happy"* followed by the neutral photograph and said "*don't know*" and finally pointed to the sad photograph and said "*sad*".

The researcher asked the participant, *"What about you? How do you feel after playing on the computer?"* If necessary, the researcher repeated the question a few times. The participant was asked to point to any photographs on the Feelings Toolkit sheet that represented his/her feeling after playing the game, in effect selecting which photograph was most similar to how they felt. The researcher repeated the steps for other bipolar adjectives *(good-bad, love-hate,* and *excited-bored)* in the *Wafiy* Feelings Toolkit. The researcher thanked the children for participating in the study.

The same nursery staff were interviewed informally while they were working. For example, the researcher went outdoors to ask for feedback/comments from one staff member about the *Wafiy*

Feelings Toolkit. The staff were monitoring the children playing outdoors. On another day the researcher approached another staff member who was handling cooking activities with the children. A colleague was interviewed informally while she was taking a break in the staff room. The researcher asked permission first from the staff before asking them questions.

4.2.3.1.2 Findings

Q1: Is the photographic representation of a nursery-aged child simple and intuitive for young children?

All the children understood the photographs except one who misinterpreted the *love* and *excited* photographs as *happy*. The child answered "*happy*" when the (*love-hate*) sheet was shown. He/she answered "happy" when the (*excited-bored*) sheet was shown. Some children liked the photographs and smiled when the *Wafiy* Feelings Toolkit was shown to them. The staff liked the idea of using the *Wafiy* photographs and one staff member said that the red top worn by the model was bright and obvious to the children. All the staff liked the *Wafiy* Feelings Toolkit. The photograph representation of a nursery-aged child is simple and intuitive for very young children.

S-Q1: Is the photograph size suitable for very young children?

In the testing, three children easily pointed to the medium-sized photographs which related to their feelings. The staff commented that the photographs size was suitable and nice. The photographs displayed in medium size are suitable for very young children.

Q2: Is the new layout of the *Wafiy* Feelings Toolkit easy for very young children?

The new layout of the *Wafiy* Feelings Toolkit was identified as easy for very young children in three aspects: scale, layout, and bipolar adjectives.

S-Q1: Are the three scales in the Feelings Toolkit easy for very young children?

All the children could understand and differentiate the scales. The children could answer all the questions by pointing to photographs or verbalising the feelings labelled in the tool. Using the *Wafiy* Feelings Toolkit, one child could express his mixed feeling of playing on the CBeebies website. The child gave mixed answers; positive, neutral, and negative feelings. Five children answered all the questions in the *Wafiy* Feelings Toolkit positively compared to the previous testing of the Pictorial Feelings Toolkit. The three scales (positive, neutral, and negative) in the *Wafiy* Feelings Toolkit are easy for very young children.

S-Q2: Is the layout of one bipolar adjective per sheet easy for very young children?

All the six children could answer all the questions in the *Wafiy* Feelings Toolkit easily without too many problems. The layout of the bipolar adjectives on four different sheets in the *Wafiy* Feelings Toolkit helped very young children to differentiate, understand, and answer all the questions in the *Wafiy* Feelings Toolkit easily. Having less information provided on one sheet at a time helped the children to understand and use the tool easily. One pair of bipolar adjectives displayed on each sheet in the *Wafiy* Feelings Toolkit is easy for very young children to understand and answer all the questions.

S-Q3: Are the bipolar adjectives chosen easy for very young children?
All the children understood the bipolar adjectives and answered them correctly except for one child who said *happy* for the *love* and *excited* photographs. When further explanation was given, the child pointed to the *love* and *excited* photographs. Other children pointed to and/or verbalised the related photographs that represented their feeling. All the bipolar adjectives chosen were understood by the children. No staff commented on the bipolar adjectives chosen in the *Wafiy* Feelings Toolkit. The bipolar adjectives were easy for many children and understandable by one child when further explanation was given by the researcher.

Q3: How is the *Wafiy* Feelings Toolkit used by very young children?
Six children displayed two ways of using the *Wafiy* Feelings Toolkit; pointing a finger and verbalising word(s). Three children pointed their fingers to relevant photographs to express their feelings after interacting with the computer. For example, participants 1, 5, and 6 pointed to all the positive photographs when answering all the questions.

Another three children used the verbalising method of word(s) used to label the emotional concepts below each of the photographs in the *Wafiy* Feelings Toolkit. Participant 2 preferred to verbalise his feelings using one word to describe his feelings after playing the maths software; *happy, good, love,* and *excited.* Participant 3 also used the verbalising method but the child misunderstood *love* and *excited* feelings as *happy.* Participant 4 used the verbalising method as well, but gave mixed answers; positives *(happy, love)*, negative *(bored)*, and neutral feelings. The children displayed two different methods of using the *Wafiy* Feelings Toolkit: pointing a finger and verbalising word(s).

Q4: What are the problems of testing the *Wafiy* Feelings Toolkit with very young children?
The problem identified when testing the *Wafiy* Feelings Toolkit with the nursery children was the difficulty of getting them to participate in the testing. The children were busy with activities pre-planned by the nursery such as storytelling, concert and graduation day practice, especially

towards the end of term before the school closed for the long summer holiday. Besides, many children chose to play outdoor games/activities. There were many attractions, i.e. children's materials and toys outside the building (Figure 4.10). Furthermore, it was summer time. The children preferred to play outdoors. During the three days conducting the user studies only six children volunteered to participate.

Figure 4.10: Toys and children's materials outside nursery building

The *Wafiy* Feelings Toolkit is a simple, intuitive, and easy evaluation tool to be used with and by very young children. It can be used to evaluate feelings after very young children interact with computer products because all the children can easily understand and use the *Wafiy* Feelings Toolkit. Nursery children and staff liked the *Wafiy* Feelings Toolkit.

The next activity was to design a girl version of the Feelings Toolkit. Girls and boys interact differently with technology (Inkpen, 1997). Thus both boy and girl Feelings Toolkit versions can be used to understand whether the gender issue affects the selection of the evaluation tool among very young children.

4.2.4 Stage 4: Design of *Alisya* Feelings Toolkit

The *Alisya* Feelings Toolkit was designed to produce a girl version of the Feelings Toolkit. The *Alisya* Feelings Toolkit is identical to the *Wafiy* Feelings Toolkit except for the photographs shown (Figure 4.11). The introductory statement started with *"Hi. This is Alisya. She was playing computer just now. She feels…."*. The other features remained the same as in the *Wafiy* Feelings Toolkit (see Section 4.2.3). It displays nine different photographs representing positive, negative and neutral feelings. Four positive photographs represent *happy*, *good*, *love*, and *excited*. Four negative photographs represent *sad*, *bad*, *hate*, and *bored*. One neutral photograph represents *don't know*.

Figure 4.11: The *Alisya* Feelings Toolkit

The same ethical procedures used in employing the *Wafiy* Feelings Toolkit (see Section 4.2.3) were followed when designing the *Alisya* Feelings Toolkit. Permission to use the girl's photographs and name was granted by the child and parent in writing.

Several questions were identified at this stage of activity:

Q1: Is photographic representation of a nursery-aged girl simple and intuitive for young children?

Q2: How do children respond to the *Alisya* Feelings Toolkit, and any special remarks?

S-Q1: Did they point to the photographs?

S-Q2: Did they verbalise word(s)?

S-Q3: Did they use other methods?

Q3: Can the new testing procedure work well/be implemented with children?

S-Q1: Are more children participating in the studies?

S-Q2: Can chairs be usefully introduced?

Q4: What are the problems with testing the *Alisya* Feelings Toolkit with very young children?

The process of designing the *Alisya* Feelings Toolkit started with taking the photographs. This was done over five days in October 2010. One nursery-aged girl model was chosen because she liked to be photographed according to her parent. The model attended another nursery in Glasgow, UK. Before the photography session started, the parent was given an explanation of the PhD study and the evaluation tool developed for very young children.

The photography session was discussed with the parent. The researcher offered choices of location, time, and equipment to photograph the girl, but the parent was willing to photo her daughter at their own place using their own digital camera. An appointment was made and the researcher went to their house to assist in the photography session, which was done at leisure at the model's home.

Hundreds of photographs were taken by the model's parent. The parent also took some photographs on other days. All the photographs were sent through the researcher's email. The process of capturing, selecting, and mapping photographs was done by the researcher using *IrfanView*, the same software as mentioned in Section 4.2.3. Figure 4.12 shows some of the photographs taken, showing facial expressions and hand gestures.

Figure 4.12: A girl model shows facial expressions and hand gestures

4.2.4.1 Test of *Alisya* Feelings Toolkit

A series of studies was conducted over five days in November 2010 to test the *Alisya* Feelings Toolkit. The objectives of the study were: to identify if photographic representation of a nursery-aged girl is simple and intuitive for very young children, to observe children using/responding to the *Alisya* Feelings Toolkit, to identify if the new testing procedure works well with children or not, and to identify problems with testing the *Alisya* Feelings Toolkit with very young children.

Fifteen children voluntarily participated in the studies (12 boys and three girls). Four children participated in only half; three participants did not answer any questions and one participant answered questions unclearly. The total participants were 11 (eight boys and three girls). Due to the small numbers of boys and girls participating in the studies, the results obtained were not divided according to gender.

4.2.4.1.1 Procedures

New procedures were introduced and implemented in testing the *Alisya* Feelings Toolkit because the children's turns needed to be organized. It was important for the researcher to manage the children participating in the studies, a lesson learned from the previous testing of the *Wafiy* Feelings Toolkit, when it was difficult to get children's participation during busy times in the nursery (see Section 4.2.3.1.2 - Q4). Besides, very young children were occupied playing with toys and other materials. Thus they could easily get bored waiting too long to take part in the study, as discussed in Section 3.2.3.6 (Recruitment).

The procedures are categorised into pre-testing and during testing.

i. Pre Testing

a. The researcher waited in the computer area in room 4.

b. Invitation and arrangement.

   The child was invited/persuaded to play on the computer. If many children attended the computer area at the same time, the researcher arranged their turns by saying (persuading): *"let your friend play first. After this will be your turn. You can wait here okay"* (waiting chairs were provided).

c. Play time.

   The child sat on a playing chair and played on/explored the CBeebies website for less than 10 minutes (if many children were waiting, only 5 minutes were allowed). If any

participants were stuck, bored or lost while playing, the researcher helped/played with them.

d. Prepare for testing.

The child was stopped and persuaded to move to the testing chair for a testing session. The researcher said: *"I want to show you something. Come, do you want to see it or not?"* Sometimes the researcher persuaded the child: *"can you help me? I need your help."* If many children were waiting, the researcher said: *"Many friends are waiting for their turns. They also want to play on the computer. Come on."*

e. Prepare for the next player.

At the same time, the researcher asked another waiting child to sit down and start playing on the CBeebies website. This was to ensure the children's interest in participating in the study was not lost due to a long waiting time.

ii. During Testing

a. The child was asked questions after playing with the computer products using the *Alisya* Feelings Toolkit.

i. The researcher explained the tool, first reading the introductory statement: *"Hi. This is Alisya. She was playing on the computer just now. She feels.. . "*

ii. Then the researcher pointed her finger to the happy photograph and said "*happy*" followed by the neutral photograph and said "*don't know*" and finally pointed to the sad photograph and said "*sad*".

iii. The researcher asked the participant: *"What about you? How do you feel after playing on the computer?"*

iv. The researcher repeated steps i – iii for the other bipolar adjectives *(good-bad, love-hate, and excited-bored)*

b. The child was thanked for participating in the study and was given a high-five.

Three types of chair were introduced in the study procedures; playing chair, waiting chair, and testing chair. The playing chair was used by the participant when playing on the computer. The waiting chair was used by other children who wanted to participate in the studies. The testing chair was used after the participant had finished playing on the computer and was ready to answer questions. These chairs were needed to help the researcher handle the study if many children came to the computer area and showed interest in taking part.

4.2.4.1.2 Findings

Q1: Is photographic representation of a nursery-aged girl simple and intuitive for young children?

All the photographs were understood by the children except for one child who misunderstood the *love* photograph as a *hi* photograph. The photographic representation of a nursery-aged girl is simple and intuitive for most of the very young children.

Q2: How do children respond to the *Alisya* Feelings Toolkit, and any special remarks?

Most children responded to the *Alisya* Feelings Toolkit using several ways as in Section 4.2.3.1.2. The methods used were pointing a finger, verbalising word(s) or sentences, nodding the head, and/or imitating the photograph. Table 4.1 summarises the participants' responses towards the *Alisya* Feelings Toolkit.

Table 4.1: Responses from nursery children during testing of *Alisya* Feelings Toolkit

	Responses	**Participants**
1.	Pointing finger to photographs.	Participant 10 pointed to all the positive photographs.
2.	Verbalising word(s) and/or sentences.	Participant 5 gave positive and neutral answers. Participant 11 answered questions by verbalising only a word.
3.	Other method • Nodding head to photographs while explanation was given by the researcher.	Participant 7 answered questions by nodding head to all the positive photographs.
4.	Other method • Mixture of imitating photograph and verbalising word.	Participant 4 and participant 6 imitated the *good* photograph and verbalised "*good"*.
5.	Other method • Mixed.	Participants 1, 2, 3, 4, 6, 8, and 9 used mixed methods.

S-Q1: Did they point to the photographs?

Only one participant pointed his finger to related photographs. At first he was confused and pointed to three empty boxes in the *Alisya* Feelings Toolkit. He named himself and two friends in the boxes, but managed to point to all the related photographs after the researcher explained the tool again. One participant consistently used the *Alisya* Feelings Toolkit by pointing, as expected when using the tool.

S-Q2: Did they verbalise word(s)?

Two participants (participant 5 and participant 11) verbalised word(s) when answering all the questions. Participant 5 answered the questions by verbalising positive and neutral emotions. He answered: *"I don't know"* for *happy-sad* and *good-bad*. At first he answered: *"I don't know"* for *love-hate*, but then he changed his mind and said: *"I love Big and Small game"*, referring to the game that he played. Next, he answered with a full sentence, *"I feel excited."*

Participant 11 who had played the *TommyZoom* game consistently verbalised a word: *"happy", "good", "love",* and *"excited".* The participant asked the researcher to help play the game, specifically to move the character, *Tommy,* up a tree. Two participants used the *Alisya* Feelings Toolkit as expected.

S-Q3: Did they use other methods?

Only one participant (participant 7) nodded her head. This was when the researcher pointed to all the positive photographs; *happy, good, love,* and *excited.* When the researcher approached her to play on the computer and to participate in the study, she said: *"I don't know how to play"*. She had problems clicking the mouse. The researcher sat down beside her and helped her to choose a game from the CBeebies website. She chose *Brum,* a game which did not require a mouse. She only needed to press the right arrow key to play the game. After 5 minutes, she was prepared for the testing session. So just this one participant used another method, nodding the head when using the *Alisya* Feelings Toolkit.

Most of the participants used mixed methods when using the *Alisya* Feelings Toolkit. For example, after playing the *Big and Small* game, participant 6 used four different methods (maximum); pointed a finger, verbalised a word, nodded his head, and imitated a photograph. When the introductory statement was read, the participant quickly pointed to the *happy* photograph, verbalised "*good*" and imitated the photograph by showing a thumbs-up sign, verbalised "*love*", and nodded his head to the "*excited"* photograph. Thus, many participants used mixed methods and one participant used the maximum four methods when using the *Alisya* Feelings Toolkit.

Participant 1 who played the *Kerwhizz* game used two different methods (minimum), verbalised word(s) and/or sentences and pointed to related photographs. When the researcher showed the *Alisya* Feelings Toolkit and read the introductory statement, he spontaneously responded by saying: *"I am not Alisya's friend. I am Gemma's friend*". The researcher smiled and said: *"Can you tell me how you feel after playing the game"?* The participant pointed his finger to the *happy* photograph, verbalised *"I feel good"* and pointed a finger to the *good* photograph, and verbalised "*love*" and "*excited*". Thus, one participant used the minimum two methods when using the *Alisya* Feelings Toolkit. Many children used different methods when using the *Alisya* Feelings Toolkit.

Q3: Can the new testing procedure work well/be implemented with children?

The new testing procedure was tested in two ways, concerning the number of children participating in the testing and the usefulness of the chairs introduced. The findings showed that the new testing procedure worked well with the children.

S-Q1: Are more children participating in the studies?

There were 15 children who voluntarily participated in the testing of the *Alisya* Feelings Toolkit. An average of three children participated in the study each day compared to the previous testing of the *Wafiy* Feelings Toolkit, where only six children took part in the testing, which averaged only two children each day. More children participated in the testing when the new testing procedure was implemented because the researcher could organise and manage the children's turns.

S-Q2: Can chairs be usefully introduced?

The chairs introduced in the new testing procedures helped the researcher to organize the participants' turns in the studies. For example, when one study was conducted, the situation in the computer room was busy and noisy. There were six children standing around the computer area and watching two participants playing on the computer. When the researcher asked them to sit down on the waiting chairs to wait for their turns, only one boy and one girl agreed. After five minutes playing, the researcher asked the participants to move to evaluation chairs. One of the waiting participants was asked to move to the playing chair and started playing on the CBeebies website.

But sometimes the different types of chairs were not used because different scenarios or unpredictable things happened. For example, one participant did not want to sit on the testing chair while answering questions and continued playing on the computer for 20 minutes even though the researcher tried to persuade her to stop several times. At that moment, there were no other children waiting for their turns to participate in the study because many of them had chosen to play outdoors. That was why the participant was allowed to play for longer and answer the questions while sitting on the testing chair. All the types of chairs introduced in the testing procedures are useful in organizing the children's turns. However, not all the chairs in the new testing procedures should be used in the studies.

Q4: What are the problems of testing the *Alisya* Feelings Toolkit with very young children?

The problem that occurred when conducting the testing of the *Alisya* Feelings Toolkit was to get full participation from all the participants. Three children participated in only half of the study, named H1, H2, and H3. They played on the computer but did not want to answer any questions.

H1 was a boy. He played the *Big and Small House* game and had problems using the mouse to move the cursor while playing the game. Then he wanted to choose another game, *TommyZoom*. He seemed unfamiliar with playing on a computer. When the researcher tried to persuade him to answer questions, he ignored her and continued exploring the computer. The researcher tried a second time by saying: *"I want to show you something. You want to see it?"* He gave no response and left the playing chair.

H2 was a boy who was very good at using the computer. He tried to help his friend who was playing on the computer before him, participant 5. Participant 5 was left-handed and had difficulties moving and left-clicking the mouse. Finally, both of them played on the computer together and chose the *Big and Small* game. H2 did not want to answer any questions but participant 5 answered the questions. The researcher tried to persuade H2 to answer questions but failed. He was not forced as the study was conducted on a natural and voluntary basis.

H3 was also a boy. He explored and played three games, *TommyZoom, In the Night Garden*, and *I Can Cook*. The researcher stopped him to prepare for the testing session. But he continued playing on the computer and focused on the computer screen. The researcher tried to persuade him by diverting his attention, showing and explaining the *Alisya* Feelings Toolkit, but he refused to talk to her. Luckily, another child came up and pointed his finger to the computer screen and said that he liked and wanted to play *Driver Dan's Story Train* game. The child was invited to play on the computer and H3 was persuaded to stop. The researcher told H3 that a friend wanted to play on the computer and it was now his friend's turn to sit on the play chair. H3 left the playing chair without answering any questions.

It is difficult and challenging to work with very young children. They cannot be forced to complete the study because the study was designed to be conducted in a nursery's natural environment on a voluntary basis.

The *Alisya* Feelings Toolkit is a simple, intuitive, and easy evaluation tool for very young children. It can be used to evaluate feelings among nursery children interacting with computer products because most children can easily understand and use the *Alisya* Feelings Toolkit. Only one child misinterpreted one photograph. The *Alisya* Feelings Toolkit will be redesigned using different photographs of the same model to produce a more intuitive and simple tool for very young children before both of the Feelings Toolkit versions, *Wafiy* and *Alisya*, will be used to test the gender issue later.

Redesign of Alisya2 Feelings Toolkit

The *Alisya2* Feelings Toolkit was redesigned to produce a more intuitive and simple tool for very young children (Figure 4.13).

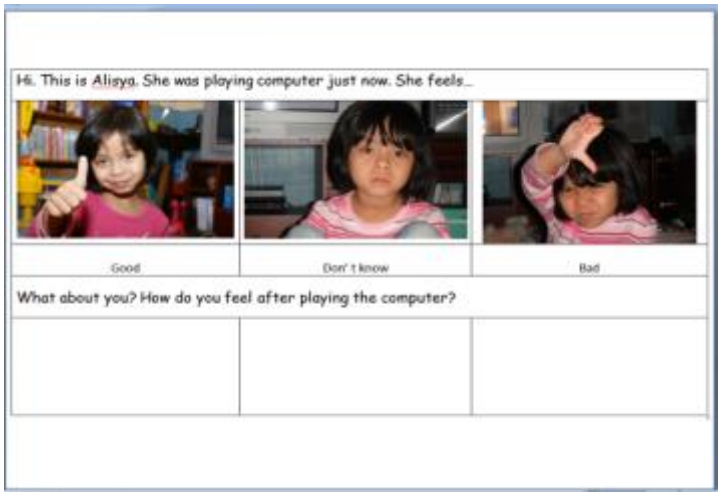


Figure 4.13: Alisya2 Feelings Toolkit (same as Figure 3.9)

Three photographs in the *Alisya* Feelings Toolkit remained the same; *happy*, *good*, and *excited.* The *happy* photograph is clear and focuses on the model's facial expression. The *good* photograph is clear and focuses on the model's hand gesture, showing a thumbs-up sign. The *excited* photograph is also clear and focuses on the facial expression and hand gestures.

Six photographs of the *Alisya* Feelings Toolkit were changed and replaced with new ones; *sad*, *bad*, *love*, *hate*, *bored*, and *neutral* (Figure 4.14). The *love* photograph was changed because one child misinterpreted it in the previous testing of the *Alisya* Feelings Toolkit (see Section 4.2.4.1.2 - Q1). The other three photographs representing negative emotions, i.e. *sad*, *bad*, and *bored*, were changed because the photographs had crowded backgrounds. The *hate* photograph was changed because the new photograph was clearer and focused on the facial expression and hand gestures. The *neutral* photograph was changed because the new photograph was clearer and larger. The new photographs show a girl model posed in close-up, focusing on her facial expressions and hand gestures.

Figure 4.14: Old and new photographs of *Alisya2* Feelings Toolkit

Several questions were identified at this stage of activity:

Q1: Are the new photographs of the nursery-aged girl model more intuitive and simple for very young children?

Q2: How do children respond to the *Alisya2* Feelings Toolkit, and any special remarks?

S-Q1: Did they point to photographs?

S-Q2: Did they verbalise word(s)?

S-Q3: Did they use other methods?

Q3: Can the new testing procedure work well/be implemented with children?

S-Q1: Are more children participating in the studies?

S-Q2: Can chairs be usefully introduced?

Q4: What are the problems of testing the *Alisya* Feelings Toolkit with very young children?

Test of Alisya2 Feelings Toolkit

A series of studies was conducted over four days in December 2010 to test the *Alisya2* Feelings Toolkit with children in the same nursery using the same study plan. The main objectives were: to identify whether the new photographs of the nursery-aged girl model were more intuitive and simple for very young children, to observe children's responses to the *Alisya2* Feelings Toolkit, to identify if the new testing procedure works well with children, and to identify the problems of testing *Alisya2* Feelings Toolkit with very young children. Thirteen children voluntarily participated in the studies (seven boys and six girls) but one girl participated in only half the study because of not having enough time to answer questions. The total participants were 12.

Procedures

The same testing procedures used for testing the *Alisya* Feelings Toolkit in Section 4.2.4.1 were followed, since the procedures worked well with very young children as reported in the findings reported in Section 4.2.4.1.2 - Q3.

Findings

Q1: Are the new photographs of the nursery-aged girl model more intuitive and simple for very young children?

All the new photographs in the *Alisya2* Feelings Toolkit were understood by all the children. The new photographs of the nursery-aged girl model are more intuitive and simple for very young children.

Q2: How do children respond to the *Alisya2* Feelings Toolkit, and any special remarks?

The children displayed various responses to the *Alisya2* Feelings Toolkit. Six children consistently used one method; pointing a finger, nodding their head to the relevant photographs, or verbalising word(s) or sentences. Six participants used mixed methods to express their feelings when using the *Alisya2* Feelings Toolkit. The responses gathered from the nursery children are summarized in Table 4.2.

Table 4.2: Responses from nursery children during testing *Alisya2* Feelings Toolkit

	Responds	**Participants**
1.	Pointing finger to photographs.	Participants 4 and 7 answered questions by pointing finger to relevant photographs.
2.	Verbalising word(s) and/or sentences.	Participant 8 answered questions by verbalising only a word.
3.	Other method • Nodding head to photographs while explanation was given by the researcher.	Participants 5, 9, and 10 answered questions by nodding their heads.
4.	Other method • Pointing finger and shaking head.	Participant 11 answered questions by pointing a finger to related photographs and shaking head to unrelated photographs.
5.	Other method • Mixed.	Participants 1, 2, 3, 6, 11 and 12 used mixed methods when answering the questions.

S-Q1: Did they point to the photographs?

Two participants pointed fingers to related photographs. Participant 4 pointed his finger to all positive photographs. Participant 7 pointed her finger to three positive photographs *(happy, good, and excited)* and a neutral photograph. Two participants consistently pointed a finger when using the *Alisya2* Feelings Toolkit.

S-Q2: Did they verbalise word(s)?

Only one participant verbalised a word that described the child's feelings, i.e. *happy*, *good*, *love*, and *excited* while answering all the questions. The participant consistently verbalised the answers when using the *Alisya2* Feelings Toolkit.

S-Q3: Did they use other methods?

Four participants used other methods. Three participants nodded their heads to relevant photographs while the researcher explained the *Alisya2* Feelings Toolkit. Participant 5, who was a new girl in the nursery, nodded her head when answering all the questions. Participants 9 and 10, both boys, nodded their heads to all the positive photographs while answering the questions. Participant 12 was the only child consistently shaking her head to irrelevant photographs while the researcher explained the *Alisya2* Feelings Toolkit and pointing a finger to relevant photographs.

Participants 1, 2, 3, 6, 11 and 12 used mixed methods when answering all the questions. Participants 1 and 2 used three mixed methods, pointing a finger, verbalising, and imitating photographs. For example, participant 1 pointed a finger and imitated the *happy* photograph for question 1, verbalising sentence(s): "*I feel good"* and *"I love the game. I play Wii at home"*, *and* pointing a finger to the *excited* photograph. Participant 2 easily verbalised *happy* and *good* but got stuck at the third adjective *(love-hate)*. After the researcher explained a few times, he answered: *"I love playing the game".* The participant had difficulty pronouncing *excited* so he imitated the *excited* photograph.

Participant 6 used three mixed methods, pointing a finger, verbalising, and nodding his head. Participants 3 and 13 used two methods, pointing a finger and verbalising a word. Many participants used other and mixed methods. Four participants used other methods and six participants used mixed methods while answering questions using the *Alisya2* Feelings Toolkit.

Q3: Can the new testing procedure work well/be implemented with children?

The new testing procedures were tested in two ways, through the number of children participating in the user studies and the usefulness of the chairs introduced. The findings show that the new testing procedures worked well with the children.

S-Q1: Are more children participating in the studies?

Twelve children voluntarily participated in the studies to test the *Alisya2* Feelings Toolkit, seven boys and five girls. On average, three children participated in the study each day since only four user studies were conducted. More children participated in the studies when the new

testing procedures were implemented because the researcher could organise and manage the children's turns.

S-Q2: Can chairs be usefully introduced?

The chairs introduced in the new testing procedures helped the researcher to organize the participants' turns in the studies. Since the researcher handled all the studies alone, a systematic and practical technique was needed to conduct studies with very young children in the nursery. For example, there were seven children gathered around the computer desk at one time during the first study. Some of them were standing behind one participant who was playing on the CBeebies website. The researcher offered waiting chairs to the children and organized their turns. When his time was up, the participant was asked to stop playing on the computer and move to a testing chair, but at first ignored this. The researcher persuaded him and showed him that many friends were sitting on chairs waiting for their turns. Finally, he agreed.

One of the waiting children was invited to move to the playing chair and was allowed to play on the computer. After a while, the child was asked to move to the testing chair but refused, tried to negotiate and said: *"I want to play one more game"*. The researcher persuaded him: *"Lots of your friends are waiting for their turns. They also want to play on the computer... Come on".* Finally the participant agreed to move to the testing chair.

In some cases, children refused to move to the testing chair because they were too engaged playing with the computer. For example, participant 10, who looked confident and was good at interacting with the computer, negotiated with the researcher, saying: *"Give me two..".* The researcher asked the participant whether he meant two more minutes or two more games to play. The participant refused to talk to the researcher and continued playing on the computer, saying: *"I haven't finished".* The researcher tried to persuade him to move to the evaluation chair and showed him the tool. Without moving his body and still sitting on a playing chair, the participant said: *"I can do here".* The researcher tried again. Finally the participant moved to the testing chair after a waiting child angrily shouted: *"That's enough! It's my turn".*

In some situations, the testing chair was not used. For example, participant 7 was not asked to move to the testing chair. The researcher asked her questions while she was sitting on the playing chair since no more children were waiting to participate in the study because it was nearly tidy-up time in the nursery.

The function of the waiting chair seemed to be understood by some children. One girl sitting on a waiting chair had said to her friend who was playing on the computer: *"I want to play on the computer. But I have to sit over here first. I know how to play this game. I am good at this".* The

different chairs introduced in the new procedures can be used to organize the children's turns when conducting user studies.

Q4: What are the problems of testing the *Alisya* Feelings Toolkit with very young children?

Only one uncontrolled problem was identified while testing the *Alisya2* Feelings Toolkit. One child could not answer any questions due to the time constraint. The girl was asked to stop playing on the computer before answering any questions because it was tidy-up time in the nursery. There were many pre-planned activities or routines which limited their involvement in the testing of the *Alisya2* Feelings Toolkit.

The *Alisya2* Feelings Toolkit is more intuitive and a simple evaluation tool for very young children. The *Alisya2* Feelings Toolkit can be used to evaluate the feeling among nursery children after interacting with computer products because all the children can easily understand and use it. Therefore, it was chosen as the final girl version of the Feelings Toolkit and renamed as the *Alisya* Feelings Toolkit (Appendix G).

The use of the tool was observed in different scenarios and environments. Observing how children use the Feelings Toolkit is explained in the next section.

4.2.5 Stage 5: Conduct Exploratory Sessions

A series of exploratory sessions to learn about children's reactions to using the Feelings Toolkit was conducted in the UK from 2009 until 2011 involving very young children aged 3 to 5 years old.

The main aim was to observe how very young children react to the Feelings Toolkit. The researcher conducted the sessions in two different environments: in a local nursery and at home. In the nursery, children explored the Feelings Toolkit with computer products and non-computer products. While at home children explored the Feelings Toolkit and Smiley-adapted-to-Feelings Toolkit.

In the next section, the sessions conducted in the nursery are described in detail.

4.2.5.1 Session 1: Observing Nursery Children Use the Feelings Toolkit with Computer Products

Session 1 was conducted with the aim of observing how nursery children use the Feelings Toolkit with a computer product. The study was conducted in December 2010 in a local nursery in Glasgow, UK (see Section 3.2.3.1). The computer product used in the study was the CBeebies website (see Section 3.2.3.3).

Procedures for conducting session 1: Children who were interested in participating in the session were invited to sit on waiting chairs. A participant was greeted and introduced to the researcher and the study, asked to sit on a playing chair in front of the computer and allowed to choose a game from the CBeebies website. The participant played the game for 5-10 minutes and was then asked to move to an evaluation chair. Next, the second participant sat on the playing chair. The same steps were repeated for every participant.

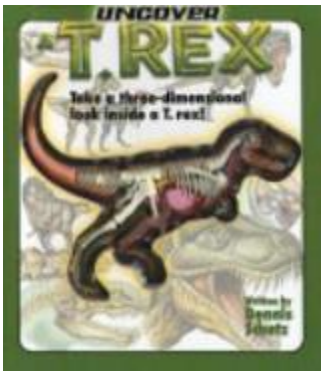
The participant who had played the game was asked to choose which Feelings Toolkit version he/she liked most, the *Wafiy* Feelings Toolkit or the *Alisya* Feelings Toolkit. An introductory statement in the Feelings Toolkit was read out: *"Hi… This is Wafiy/Alisya. He/she was playing on the computer just now. He/she feels…"* and the Feelings Toolkit was explained to the participant. The researcher pointed to each photograph and verbalised each feeling. The participant was asked to indicate/point to whichever photograph represented how he/she felt after playing on the computer, in effect saying which picture of *Wafiy* or *Alisya* was most similar to his/her feeling. This was repeated for three other bipolar adjectives in the Feelings Toolkit. After the session, the participant was thanked and given a high-five.

Another session which was conducted at the same nursery but using non-computer products is described in the next section.

4.2.5.2 Session 2: Observing Nursery Children Use the Feelings Toolkit with Non-Computer Products

Session 2 was conducted in February 2011 at the same nursery with the aim of observing how nursery children use the Feelings Toolkit with non-computer products. The non-computer products were chosen because in the nursery, children not only play with computer products but also with non-computer products. The non-computer products used were a 3D story book, a magnetic train toy, a colouring sheet (based on a popular cartoon character), and a maths puzzle (Figure 4.15). It took four days to conduct the sessions, with one different activity per day; storytelling, playing with the magnetic train toy, colouring, and playing with the puzzles.

A 3D book entitled *Uncover T.Rex* which combines text and a dinosaur model was chosen because the researcher assumed it might attract more participation from boys and the magnetic train toy was chosen for the same reason. Playing with magnetic trains requires children to link each of the magnetic coaches. A *Dora the Explorer* sheet was chosen because the researcher assumed it would attract more participation from girls. The researcher brought coloured pencils and different printed cartoon sheets for the children. The maths puzzle was chosen because the researcher assumed it would attract more participation from girls.



Uncover T.Rex Book

Magnetic train toy

Dora the Explorer Colouring Sheet

Fun with 123 maths puzzle

Figure 4.15: Non-computer products used in the studies

Seven nursery children (six boys and one girl) participated in the first session and 24 children (14 boys and 10 girls) participated in the second session as shown in Table 4.3. The participation was on a voluntary basis. The small number of participants in session 1 was probably due to the heavy winter in Glasgow (December 2010), an uncontrolled weather factor. Session 2 had more participants, possibly because the session was conducted using four different non-computer products.

Table 4.3: Number of participants in nursery according to gender

Exploratory Sessions (UK Nursery)	Number of Participants		Total
	Boy	Girl	

Session 1	6	1	7
Session 2	14	10	24

Procedures for conducting session 2: The procedures applied in session 2 were the same as the procedures in session 1 except that the activity was changed from playing on the computer (in study A) to storytelling, playing with a magnetic train, colouring, and doing puzzles (in session 2). Each day only one activity was conducted due to time constraints. Different types of chair (waiting, playing, and evaluation chairs) to manage the children's turns as in session 1 were not used in session 2 because the children were allowed to play or to do activities on the table or on the floor. An introductory statement in the Feelings Toolkit was changed according to the activities: *"Hi.. This is Wafiy/Alisya. He/she was listening to storytelling/ playing trains/colouring a Dora sheet/playing puzzles just now. He/she feels…"* .

The researcher observed the nursery children using the Feelings Toolkit with computer products and non-computer products. The observation data/results are reported accordingly:

In session 1: Children displayed different styles of using the tool; some children nodded their heads as the feeling labels were read out by the researcher, some pointed to the photographs that represented their feelings, some responded verbally by saying a word or phrase that described their feelings, such as *happy*, *good*, *love*, *excited*, *hate*, and *don't know*. Other children, prompted by the feelings shown, answered questions by giving full sentences about their feelings and elaborated on their reasons. For example, "*hate… Sometimes..I don't know how to play*". Some children liked to imitate the feelings shown in the photographs, particularly when they felt positive feelings such as *happy* or *excited.*

In session 2: Children also used the Feelings Toolkit in many ways after interacting with the non-computer products, for example, in the storytelling activity, pointing a finger, imitating the photographs, verbalising word(s), nodding heads, and combining a number of methods. Some children liked to point their fingers to related photographs and one boy liked to imitate the photographs such as *good, bad, love,* and *bored*. Some children comfortably used mixed methods when using the tool. They expressed their feelings by verbalising word(s) loudly and clearly and also pointing their fingers to the related photographs. One girl pointed her finger to related photographs and nodded her head. But one boy pointed his finger to all the photographs and nodded his head. He chose all the photographs in the Feelings Toolkit. From the researcher's observation and informed by nursery staff, the boy has speech difficulties.

Moreover, after playing with the magnetic train, all of the children pointed their fingers when using the Feelings Toolkit. Some children verbalised *"yeah"* or "*this"* while pointing to the related photographs. Only a few children nodded their heads when using the Feelings Toolkit. One girl commented about the introductory statement when using the *Alisya* Feelings Toolkit: *"I like something to start with my name in the beginning."*

After colouring the *Dora the Explorer* sheet, some children reacted to the Feelings Toolkit versions using mixed methods. They nodded their head, pointed their finger, imitated photographs, and verbalised word(s). One child consistently nodded her head while using the Feelings Toolkit. Two children consistently pointed their finger to the positive photographs. One child (a girl) used two methods to answer all the questions. She imitated the *good* photograph and verbalised "*happy"* and *"love".* After playing with the maths puzzles, most children responded to the Feelings Toolkit by pointing their fingers. Only one boy used mixed methods: pointing his finger, imitating photographs, and nodding his head.

Two girls were able to verbalise their positive or negative feelings in full sentences. One verbalised: *"I feel happy", "I feel good,* and *"I love playing puzzle"*. She also pointed to the *excited* photograph. But the other girl pointed her finger to three photographs *(sad*, *bad* and *hate)* before she verbalised: *"I don't like it", "I don't like puzzle",* and *"I don't know how to play"*. The girl also pointed her finger to the neutral photograph in the *excited-bored* sheet. The researcher observed that the nursery children used the Feelings Toolkit in many ways.

Strengths and weaknesses of the Feelings Toolkit versions were identified from the observation data and reported according to the study:

In session 1: Most children liked interacting with the photographs and this was obvious during the study; some children laughed and tried to imitate some facial expressions on the photographs. For example, one boy laughed at *Wafiy's* sad face and described the photograph as funny. Another boy pointed, imitated, and laughed at *Wafiy's* neutral face. One girl smiled and pointed her finger at *Alisya's* photographs during the study. One girl recognized some of the photographs on the *Alisya* Feelings Toolkit (for example *happy-sad* and *good-bad*) and remembered she had seen the photographs before (in testing the Feelings Toolkit). That might be why so much of any nursery's equipment, toys, books, posters, and even their jacket holder labelling system in the cloakroom area use photographs instead of graphics or other kinds of representation.

The children were mostly positive about the tools, with some children laughing and engaging with the photographs. Only one child had difficulty in pronouncing the feelings label, *excited*, and had to point instead. Most of the children gave positive opinions about their emotions

during the user studies. In contrast to Read and MacFarlane (2006), the findings show that very young children gave negative and neutral ratings as well. For example, one boy specifically stated he hated the game because he didn't know how to play it. One boy rated neutral for two bipolar adjectives *(love-hate* and *excited-bored)*. Another boy imitated the neutral photograph in the *good-bad* and *excited-bored* sheets. This shows that children were not just simply choosing positive photographs but also negative and neutral photographs.

One child perceived the *happy* photograph as a *good* photograph. But after the researcher explained further, the child seemed to understand and pointed to the related photograph. The explanation by the researcher helped the child to use the tool.

In session 2: The Feelings Toolkit versions seemed easy for very young children to use. It can be used in many ways, not limited to pointing a finger. For instance, some children used mixed methods when using the Feelings Toolkit versions. Rich data could be gathered if children were able to reason their answers. There was evidence that some children can reason their answers in a simple sentence when using the Feelings Toolkit versions.

The findings of session 1 demonstrate that the Feelings Toolkit versions can be used by very young children to express their feelings after interacting with computer products. The children displayed different methods in answering questions using the Feelings Toolkit versions; pointing a finger, nodding heads, verbalising word(s), and imitating photographs. The strengths of the Feelings Toolkit identified were that the children liked and engaged with the photographs. They laughed, imitated, smiled, and recognised some photographs. Children gave various answers, positive, negative, and neutral, which were not just simply to please and impress the researcher.

The Feelings Toolkit versions can also be used with non-computer products, as shown in the findings of session 2. They could be used by very young children to elicit their feelings after four non-computing activities were conducted with the children in the same nursery. The activities were storytelling, playing with a magnetic train, colouring sheets, and playing puzzles.

Both the exploratory sessions indicate that very young children in the nursery react to (use) the Feelings Toolkit in many ways after interacting with both computer products and non-computer products.

The researcher continued exploring the children's reactions to using the Feelings Toolkit by comparing it to a tool that uses smiley faces adapted to the Feelings Toolkit. A series of

exploratory sessions were conducted in the home environment with very young children. Details of the session are explained in the next section.

4.2.5.3 Session 3: Observing Children at Home Use the Feelings Toolkit Compared to Smiley-adapted-to-Feelings Toolkit

Session 3 was conducted in the home environment in the UK. The aim was to observe how children at home use the Feelings Toolkit versions (*Wafiy* and *Alisya*) compared to the Smiley-adapted-to-Feelings Toolkit. Parents conducted the session with their children in their own homes. Conducting a session at home was different to the nursery since it is more relaxing and quieter compared to the nursery, which is busy and noisy. The home environment is a very safe, pleasant, and familiar place to the children. Furthermore, the children have parents around during the session, so the children might behave and respond more naturally. They might also converse confidently and openly with their parents or adults that they are familiar with. Therefore, new and rich data were expected to be gathered in the session conducted in the home environment.

In this session, the parents acted as co-informants. The researcher asked for comments and suggestion from the parents on the evaluation tools used. The computer product used in the studies was also the CBeebies website. Details of the website are explained in Section 3.2.3.3.

Sixteen children (eight boys and eight girls) participated in the sessions in their homes. They used their own computers/laptops for the session as shown in Figure 4.16.

Figure 4.16: Children participated in a study at their homes

The same procedure as in session 1 was applied in this session (see Section 4.2.5.1). The difference was that another evaluation tool was used together with the Feelings Toolkit. This was the Smiley-adapted-to-Feelings Toolkit. It used smiley faces and was adapted to the Feelings Toolkit's layout, but it contained only three different smiley faces (positive, neutral,

and negative) representing four positive feelings (*happy, good, love, excited*), four negative feelings (*sad, bad, hate, bored*), and one neutral feeling.

Appendix H shows a complete version of the Smiley-adapted-to-Feelings Toolkit. The children could choose the tool that they liked most: the Feelings Toolkit versions (*Wafiy* or *Alisya*) or the Smiley-adapted-to-Feelings Toolkit. If they chose the Smiley-adapted-to-Feelings Toolkit, an introductory statement about the tool as shown in Figure 4.17 was read out: *"Hi… This is Smiley. Smiley was playing computer just now. Smiley feels…"* and the tool was explained to the participant. Other procedures were the same as in session 1.

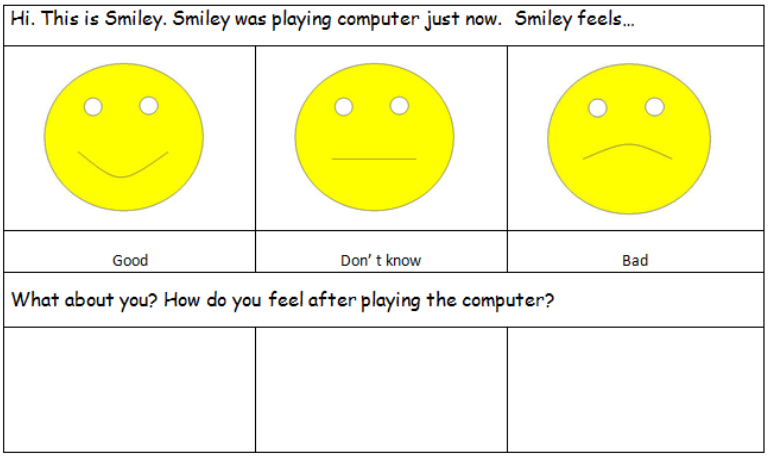


Figure 4.17: The Smiley-adapted-to-Feelings Toolkit

In the exploratory sessions conducted at home, eight children selected the *Wafiy* Feelings Toolkit, three selected the *Alisya* Feelings Toolkit and five selected the Smiley-adapted-to-Feelings Toolkit. One of the children who selected the Smiley-adapted-to-Feelings Toolkit said: *"I like the smiley because it uses smiley faces and in yellow colour"*.

The parents observed their children at home using the selected tool with the computer product. They collected the data and passed it to the researcher. One child consistently verbalised all the answers and two children pointed their fingers and nodded their heads when using the Smiley-adapted-to-Feelings Toolkit. Three children easily pointed their finger to all related photographs in the Feelings Toolkit. One child used the *Wafiy* Feelings Toolkit in two ways: verbalising word(s) such as "*happy"* and *"don't know"* and pointing a finger at positive photographs (*love* and *excited*). Three children consistently pointed to all the positive photographs in the Feelings Toolkit versions. One child verbalised "*excited"*. One girl imitated the *excited* photograph. One

child imitated all the positive photographs in the *Wafiy* Feelings Toolkit and the same child also pointed and nodded to the *happy* and *love* photographs.

Most of the children who took part in this session at home displayed the same reactions as the nursery children when using the evaluation tool (see Section 4.2.5.1 and Section 4.2.5.2). Children used many methods for the selected evaluation tool after interacting with the computer product.

Using the *Wafiy* Feelings Toolkit, one child imitated facial expressions and hand gestures in the positive photographs. One parent wrote that his son raised two hands and jumped up, showing that he was *excited*. His son smiled, nodded his head, and pointed a finger at the *happy* photograph. His son imitated the thumbs-up sign as in the *good* photograph. Two children (one boy and one girl) showed positive feelings after interacting with the CBeebies website. One boy showed positive and neutral feelings. One child expressed his mixed feelings and the child did not simply choose positive photographs. One boy showed mixed feelings: *happy*, *good*, *love* and *neutral*. One boy imitated the *excited* photograph (using hand gestures) but verbalised "*happy"* for *excited-bored*. One boy had mixed feelings: positive, neutral, and negative.

Using the *Alisya* Feelings Toolkit, one girl tried to explain why she liked playing on the CBeebies website. The girl liked interacting with the tool and asking more questions from her parent: *"I want more questions."* One girl showed positive feelings. One boy showed mixed feelings: three positives and one negative.

Using the Smiley-adapted-to-Feelings Toolkit, one child verbalised the entire set of positive feelings correctly except for *excited-bored*. The child verbalised "*happy*" instead of "*excited*". Two children showed positive feelings *(happy, good, love,* and *excited)* after interacting with the computer product. One girl showed all the negative feelings after interacting with the computer product. One boy had difficulty expressing his feelings so his parent asked him to re-select the evaluation tools and he selected the *Alisya* Feelings Toolkit. But the parent wrote all the responses in the Smiley-adapted-to-Feelings Toolkit sheet. Using the *Alisya* Feelings Toolkit, the child showed all the positive feelings after interacting with the computer product.

However, one parent had difficulty asking questions and getting answers from her child when using the Smiley-adapted-to-Feelings Toolkit. The parent had to use two tools, the Smiley-adapted-to-Feelings Toolkit and the *Alisya* Feelings Toolkit. Besides, a mistake was made by one child in interpreting *excited* smiley faces in the Smiley-adapted-to-Feelings Toolkit because

it is the same for all the positive feelings. The Smiley-adapted-to-Feelings Toolkit seemed not to be straightforward for one child.

Comments and suggestions from parents were also gathered from this session and the researcher interviewed the parents. One parent said that the Feelings Toolkit is very expressive and clear because it has different photographs representing different emotions. The parent suggested that the Feelings Toolkit background should be changed to one colour so that the model's expressions are much clearer and more obvious. One parent suggested an introductory statement in the Feelings Toolkit and that the Smiley-adapted-to-Feelings Toolkit should be dropped as it is not straightforward. Besides, the parent commented that the *love* photograph in both of the Feelings Toolkit versions is not clear. The Feelings Toolkit is very expressive and clear compared to the Smiley-adapted-to-Feelings Toolkit but it needs some further modification.

One parent commented that the Smiley-adapted-to-Feelings Toolkit was interesting. However, according to another parent, using the Smiley-adapted-to-Feelings Toolkit was difficult and could not help her child to understand and react to all of the questions. This was because there were only three smiley faces representing nine different feelings. Therefore, the parent asked her child to re-select one of the Feelings Toolkit versions. The child selected the *Alisya* Feelings Toolkit and it helped her to understand and react to all the questions because the *Alisya* Feelings Toolkit has nine different photographs representing nine different feelings.

All of the parents said that they took only 10 to 15 minutes to complete the session with their children at home. Using the Feelings Toolkit versions to ask questions and get answers from their children was easy and interesting. Their children were able to use the tool. Thus, they successfully conducted the session in a short time. Very young children at home can use the Feelings Toolkit and the Smiley-adapted-to-Feelings Toolkit. Using the selected evaluation tool, children used many methods to express their feelings after interacting with the computer product. Only one child misinterpreted the positive feeling in the Smiley-adapted-to-Feelings Toolkit because all of the positive smiley faces were the same. The Smiley-adapted-to-Feelings Toolkit seemed not to be straightforward for one child only.

Regardless of who conducted the study, children at home used the evaluation tools in the same way as the nursery children. The next section summarizes the series of exploratory sessions that were conducted in Stage 5 to learn about children's reactions to using the Feelings Toolkit.

4.2.5.4 Summary of Stage 5

A series of exploratory sessions was conducted with the aim of learning about children's reactions to using the Feelings Toolkit. The researcher observed very young children using the Feelings Toolkit in two different environments; in a local nursery and at home: (i) nursery children used the Feelings Toolkit with computer products and non-computer products, (ii) children at home used the Feelings Toolkit compared to the Smiley-adapted-to-Feelings Toolkit.

In the nursery, two sessions were conducted. In session 1, the researcher learned that the Feelings Toolkit versions can be used with computer products. Moreover, in session 2, the Feelings Toolkit versions can also be used with non-computer products. Children used the tool in many ways, not limited to pointing a finger to related photographs. In fact, some children could further explain the reasons for their feelings after playing with the computer product. The strengths of the Feelings Toolkit were identified - children liked and engaged with the photographs. They laughed, imitated, smiled, and recognised some photographs. Despite the strengths, a weakness of the Feelings Toolkit was identified when one child misinterpreted the *happy* photograph as a *good* photograph.

At home, children can use the Feelings Toolkit and the Smiley-adapted-to-Feelings Toolkit. They used the selected evaluation tool in the same ways as the nursery children did. The findings at home followed the findings at the nursery. Thus, the detail of who conducted the study did not affect the ways the very young children used the tool.

The parents involved in the study at home gave positive feedback about the Feelings Toolkit - very expressive and clear, easy, simple, and interesting. They commented that they took a short time to complete the session using the Feelings Toolkit. However, one parent commented that the *love* photographs used in both of the Feelings Toolkit versions were not clear. One parent highlighted that she had problems using the Smiley-adapted-to-Feelings Toolkit. Therefore she used the *Alisya* Feelings Toolkit together with the Smiley-adapted-to-Feelings Toolkit while conducting the session.

A further study to validate the Feelings Toolkit was conducted. The study was conducted in Malaysia to gain different experiences of exploring the tool cross-culturally. This is explained in the next section.

4.2.6 Stage 6: Validate Existing Feelings Toolkit (Malaysia)

The researcher conducted a validation study in two environments in Malaysia; in a kindergarten and at home, to refine the design of the existing Feelings Toolkit within a Malaysian context. The Feelings Toolkit was developed with the participation of nursery children and very young children at home in the UK. A problem highlighted with the existing Feelings Toolkit was that one photograph was misunderstood by one parent who conducted an exploratory session with her child at home in the UK. Details of the validation study are described in the next section.

4.2.6.1 Validation Study in Kindergarten (Malaysia)

The aim of the validation study was to ask older children (6 years old) to identify photographs used to represent feelings in the existing Feelings Toolkit. Children aged 6 to 7 years old have the ability to identify emotions conveyed in photographs (Guarnera et al., 2015). In this study, the researcher asked kindergarten children to identify eight photographs that had been used to represent four bipolar adjectives in the Feelings Toolkit *(happy-sad, good-bad, love-hate, excited-bored).* Only positive and negative photographs were to be identified due to the problem identified (see Section 4.2.5.3). The researcher retained the neutral photograph because no issue had arisen with it. Furthermore, the neutral photograph for each of the Feelings Toolkit versions is the same in all sheets (four).

4.2.6.1.1 Kindergarten

The validation study was conducted at a kindergarten in Malaysia. This kindergarten was chosen based on three conditions; it operates consistent opening hours, follows the national curriculum, and has the equipment required in the study such as chairs, table, and a suitable room. The total number of children registered at the kindergarten was 84, aged 4 to 6 years old (see Table 4.4). Only older children, 6 years old, were involved in this study.

Children's Age (years old)	Number of Children
4	18
5	40
6	26
Total	84

Table 4.4: Kindergarten children participating in the study

4.2.6.1.2 Participants in Kindergarten

Twenty children (11 boys and 9 girls) aged 6 years old participated in the study. The researcher prepared 26 parental consent forms. The kindergarten teacher volunteered to distribute it. The

teacher took a few days to distribute the forms to all parents because not all the parents sent their children to the nursery every day for several reasons including health problems. Twenty forms were returned to the kindergarten.

4.2.6.1.3 Procedures in Kindergarten

Before starting the study, the researcher briefly introduced herself and informed about the study, then invited the kindergarten children by saying: *"Who wants to take part, please raise your hand".* The researcher identified the children and assigned them turns. Only one child was selected at a time to participate in the study. The child was invited to the kindergarten's office, where the study was conducted.

Each child did the study twice – in round 1 and in round 2. This was to check the consistency of the children in identifying the photographs. Figure 4.18 shows how the Feelings Toolkit sheets were organised in round 1 (R1) and round 2 (R2). In each round, the photographs were organised in a different order. This was to serve as a control mechanism to avoid children simply answering all the questions in the study and was also to prevent children from answering all the questions positively just to please the researcher.

The researcher prepared a step-by-step procedure to conduct the study:

1. Ask a kindergarten child to choose a tool depending on which version the child likes most; a boy or a girl version.
2. Organise the tool as in Round 1 (Figure 4.18).
3. Ask the child to point to the related photograph as organised in Figure 4.18.
   E.g. *"Please show me which one is a happy picture."*
4. Write the answers on an answer sheet (Appendix I).
   If the answer is correct, then tick.
   If the answer is wrong, then write what the child answered.
5. Organise the instrument as in Round 2 (Figure 4.18).
6. Repeat steps 3 – 4 for other photographs.

Figure 4.18 shows the organisation of the four sheets of the Feelings Toolkit in Round 1 (R1) and Round 2 (R2).

Round 1 (R1)	Happy – Sad / Good - Bad Love – Hate / Excited - Bored

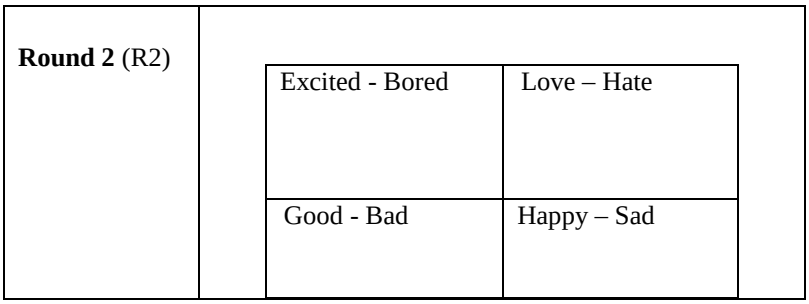


Figure 4.18: Organisation of Feelings Toolkit sheets

The result of the validation study that was conducted in the kindergarten is explained in Section 4.2.6.3. The researcher continued validating the Feelings Toolkit in the home environment. Details of the study are explained in the next section.

4.2.6.2 Validation Study at Home (Malaysia)

The aim of the validation study was to ask older children aged 6 to identify the photographs used in the existing Feelings Toolkit. This time the study was conducted in the home environment by parents with their child to see any differences compared to kindergarten children.

4.2.6.2.1 Participants at Home

For convenience purposes, to recruit participants, the researcher randomly telephoned (using a telephone directory) and invited 40 parents who were colleagues from her workplace to take part in the study. The researcher asked them if they had suitable children (aged 6) to participate in the study. In total, 21 parents agreed to take part in the study. Twenty-one children (10 boys and 11 girls) aged 6 years old participated in the study. The researcher prepared and distributed 21 evaluation sets to 21 parents. The researcher briefed the parents on how to conduct the study and gave them one week to return the evaluation set.

4.2.6.2.2 Procedures at Home

In the validation study, the researcher distributed an envelope containing an instruction sheet for parents (Appendix J), two Feelings Toolkit versions (the *Wafiy* Feelings Toolkit and the *Alisya* Feelings Toolkit) and a consent form to be filled in by the parents. Each of the Feelings Toolkit sheets was numbered 1 to 4 according to 1 = *happy-sad*, 2 = *good-bad*, 3 = *love-hate*, and 4 = *excited-bored*. All texts in the Feelings Toolkit were removed. Figure 4.19 shows the *Wafiy* Feelings Toolkit with positive and negative photographs only (without text).

Figure 4.19: The *Wafiy* Feelings Toolkit with positive and negative photographs only (4 sheets)

The Feelings Toolkit contains only positive and negative photographs to be identified by older children aged 6 years. The researcher briefed each parent on how to conduct the study with their children at home and guaranteed them it would only take about 5 minutes (based on the researcher's experience conducting the same validation study in the kindergarten, see Section 4.2.6.1).

The details of the instructions for parents were:

1. Ask a child to choose a tool depending on which version the child likes most; a boy or a girl version.
2. Organise the tool as in Round 1 (Figure 4.18).
3. Ask the child to point to the related photograph.
   E.g. *"Please show me/mommy/daddy which picture is happy."*
4. Write the answers in the Feelings Toolkit tool (in empty boxes below photographs).
5. Organise the tool as in Round 2 (Figure 4.18).
6. Repeat steps number 3 - 4.
7. Don't forget to photograph the session.

4.2.6.3 Results and Discussion of the Validation Study

Data was gathered from 41 participants. Analysis was done based on the score of correct photographs (positive and negative) identified and the result is presented in percentages as in Table 4.5. The results are reported according to the context of the study conducted.

In kindergarten (20 children): For the *Wafiy* Feelings Toolkit version, obviously the highest score for a positive photograph was *good* (100%) and highest score for a negative photograph was *bad* (100%) in R1. In R2, the highest score for a positive photograph was *good* (100%) and the highest score for a negative photograph was *bad* (90.9%). For the *good* photograph, it shows consistent results in both rounds. For the *bad* photograph, the result was decreased in R2.

For the *Alisya* Feelings Toolkit version, two positive photographs shared the same highest score; *good* (100%) and *excited* (100%) in R1. The highest score for a negative photograph was *bad* (88.9%) in R1. In R2, the highest score for a positive photograph was *good* (100%) and the highest score for a negative photograph was *bad* (88.9%). For *good* and *bad* photographs, this shows consistent results in both rounds. For the *excited* photograph, the result was decreased in R2 (66.7%).

In the validation study conducted in the kindergarten, with detailed results in Appendix K, the main results are that the majority of the children were able to identify the good and bad emotions conveyed in the photographs. This is similar to a study conducted by Widen and Russell (2016) (see Section 2.4). Very young children aged 3 understood the Children's Scales of Pleasure and Arousal (CSPA), an instrument to assess children's subjective and descriptive judgement of two dimensions: pleasure and arousal.

Zimmerman et al. (2006) define how well someone is feeling (pleasure or displeasure), at the level of subjective experience, as valence. Different labels for valence include pleasure, pleasantness, hedonic tone, utility, good–bad mood, approach–avoidance, rewarding–punishing, appetitive–aversive, and positive–negative. All human languages have words to communicate pleasure or displeasure (Wierzbicka, 1992). According to Russell (2003), the core affect is a state of experiencing feeling good or bad, energized, or enervated.

Zimmerman et al. (2006) agree that there is no mutual understanding of the structure of emotions. To describe them, two different approaches can be used. Emotion can be organized in dimensions or in categories. The emotion category is based on language, such as fear, happiness, sadness, anger, indignation, contempt, contentment, pride, envy, love, hate, surprise, disgust, nostalgia, melancholy, satisfaction, and more. In this validation study, fewer children were able to identify the emotions of happy, sad, love, and hate. This was in contrast to a study

conducted by Székely et al. (2011), where children as young as 3 years old could recognise happiness and sadness (see section 2.4). They also further describe the core affect in two independent dimensions, valence and arousal. Valence refers to subjective experience, i.e. how well one is feeling (pleasure or displeasure). Arousal refers to a sense of mobilization or energy.

From the validation study, it can be concluded that kindergarten children perceived *good* and *bad* photographs as what they were meant to be.

At home (21 children): For the *Wafiy* Feelings Toolkit version, the highest score for a positive photograph was *good* (91.7%) and the highest score for a negative photograph was *bad* (100%) in R1. In R2, the highest score for a positive photograph was *good* (91.7%) and the highest score for a negative photograph was *bad* (91.7%). For the *good* photograph, this shows consistent results in both rounds. For the *bad* photograph, the result was decreased in R2.

For the *Alisya* Feelings Toolkit version, the highest score for a positive photograph was *good* (88.9%) in R1. The highest score for a negative photograph was *bad* (77.8%) in R1. In R2, the highest score for a positive photograph was *good* (100%) and the highest score for a negative photograph was *sad* (100%). For the *good* photograph, the result showed an increment in R2. Two different negative photographs scored highest in R1 and R2, *bad* and *sad*. For the *bad* photograph, the result was decreased in R2 (66.7%). For the *sad* photograph, the result was increased. In R1, the score was 55.6% and 100% in R2.

It can be concluded that children at home perceived the *good* photograph as what it was meant to be. For the negative photograph, a conclusion could not be made due to the inconsistent results for the *bad* and *sad* photographs in both rounds. Appendix L shows detailed results of the validation study conducted at home.

Table 4.5: Score of correct photographs (positive and negative) identified and results presented in percentage

	Kindergarten (20 children)				Home (21 children)			
Feelings Toolkit Version	*Wafiy* (11 children)		*Alisya* (9 children)		*Wafiy* (12 children)		*Alisya* (9 children)	
Photograph	R1 %	R2 %	R1 %	R2 %	R1 %	R2 %	R1 %	R2 %
Happy	27.3	18.2	0.0	22.2	66.7	75.0	33.3	33.3
Sad	36.4	36.4	55.6	22.2	83.3	25.0	55.6	**100.0**
Good	**100.0**	**100.0**	**100.0**	**100.0**	**91.7**	**91.7**	**88.9**	**100.0**
Bad	**100.0**	**90.9**	**88.9**	**88.9**	**100.0**	**91.7**	**77.8**	55.6
Love	36.4	36.4	0.0	22.2	41.7	50.0	33.3	11.1
Hate	0.0	9.1	0.0	11.1	8.3	25.0	11.1	0.0
Excited	27.3	27.3	**100.0**	66.7	50.0	66.7	77.8	66.7
Bored	9.1	0.0	11.1	33.3	41.7	16.7	33.3	55.6

To check the participant's consistency in identifying the photographs, the researcher calculated the average scores for both rounds (R1 and R2) as shown in Table 4.6. The researcher also calculated the average score for each environment (Table 4.6). For the *Wafiy* Feelings Toolkit version, the results for the *good* photograph and *bad* photograph in both environments were the highest, scoring more than 90%. For the *Alisya* Feelings Toolkit version, the results for the *good* and *bad* photograph in both environments were also the highest. For the *good* photograph, the score was more than 90% but for the *bad* photograph the score was below 90% (77.8%).

Table 4.6: Average scores for both rounds (R1 and R2) and average scores for both environments (kindergarten and home)

	Kindergarten		Home		Both Environments	
Fun-S versions	*Wafiy*	*Alisya*	*Wafiy*	*Alisya*	*Wafiy*	*Alisya*
Photograph	Avg %	Avg %	Avg %	Avg %	Avg %	Avg %
Happy	22.75	11.1	70.85	33.3	46.80	22.20
Sad	36.4	38.9	54.15	77.8	45.28	58.35
Good	100	100	91.7	94.45	**95.85**	**97.23**
Bad	95.45	88.9	95.85	66.7	**95.65**	**77.80**
Love	36.4	11.1	45.85	22.2	41.13	16.65
Hate	4.55	5.55	16.65	5.55	10.60	5.55
Excited	27.3	83.35	58.35	72.25	42.83	77.80
Bored	4.55	22.2	29.2	44.45	16.88	33.33

In the validation study, the *good* and *bad* photographs were the photographs most correctly identified by older children. Thus, the *good* and *bad* photographs were chosen to represent a positive feeling and a negative feeling in the final version of the *Wafiy* Feelings Toolkit and *Alisya* Feelings Toolkit. The final version contained only one bipolar adjective *(good – bad)* on one sheet (Figure 4.20 and Figure 4.21).

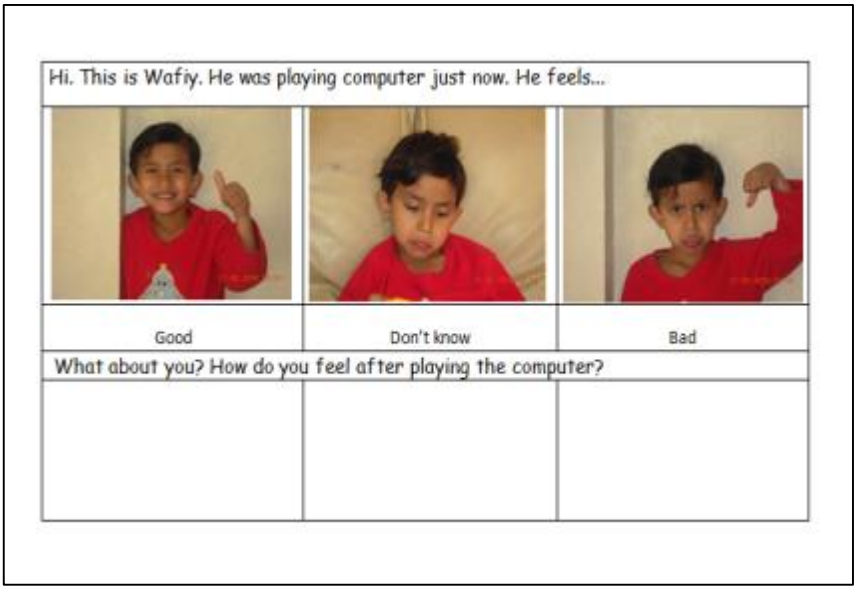


Figure 4.20: The final version of *Wafiy* Feelings Toolkit (1 sheet)

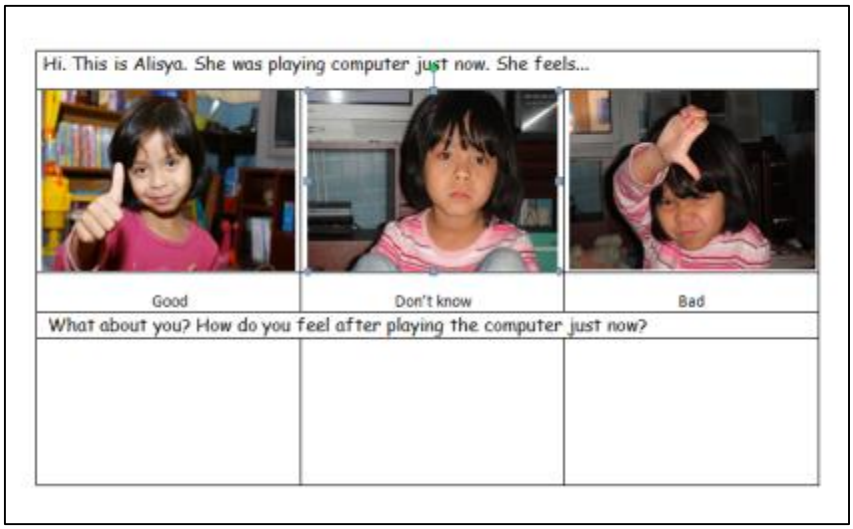


Figure 4.21: The final version of *Alisya* Feelings Toolkit (1 sheet)

4.3 Summary

This chapter discussed the development phase in the research. The main objective was achieved. The Feelings Toolkit, a new evaluation tool, was developed for very young children (aged 3 to 5 years old). The development of the Feelings Toolkit applied a methodology based on iterative design and children's participation.

The iterative process of designing–testing–redesigning the tool can be categorised into six stages. Along the process a few initial tools were constructed – the Smiley Feelings Toolkit, Pictorial Feelings Toolkit, *Wafiy* Feelings Toolkit, and *Alisya* Feelings Toolkit. Eventually, the Feelings Toolkit was constructed.

The design of each of the versions applied particular representations. The Smiley Feelings Toolkit used smiley emoticons, a Likert scale, and bipolar adjectives. The Pictorial Tool used photographs and Semantic Differential scales. The *Wafiy* Feelings Toolkit and the *Alisya* Feelings Toolkit used photographs and bipolar adjectives.

A series of studies was conducted with nursery children to test all the Feelings Toolkit versions. Testing of the Smiley Feelings Toolkit detected problems with it and produced the outcome of stage 1. Testing the Pictorial Feelings Toolkit detected some problems but the version liked most could not be identified - either the Smiley Feelings Toolkit or the Pictorial Feelings Toolkit. Thus discussion and interviews with nursery staff were conducted to get more information. The Pictorial Feelings Toolkit was liked most by the nursery staff.

The staff feedback produced the outcome of stage 2, helping to design the *Wafiy* Feelings Toolkit. Testing of the *Wafiy* Feelings Toolkit showed that children liked and could use the tool. Nursery staff were satisfied with the design and liked the *Wafiy* Feelings Toolkit. A girl version, *Alisya* Feelings Toolkit, was designed based on the *Wafiy* Feelings Toolkit. Testing of the *Alisya* Feelings Toolkit used new procedures which introduced different chairs to organize the children's turns in the user studies. The testing showed that children displayed many ways of using the tool, which gives very young children flexibility in using it. The *Alisya2* Feelings Toolkit was redesigned to choose better photographs. Testing of the *Alisya2* Feelings Toolkit then confirmed that it was chosen as the girl version. It was renamed the *Alisya* Feelings Toolkit. The use of the *Wafiy* Feelings Toolkit and the *Alisya* Feelings Toolkit was observed in a series of exploratory sessions.

A series of exploratory sessions was conducted in the UK to learn about children's reactions to using the *Wafiy* Feelings Toolkit and the *Alisya* Feelings Toolkit. Session 1 used computer products and session 2 used non-computer products. The findings of the studies showed that the Feelings Toolkit versions can be used by very young children after interacting with either computer products or non-computer products.

In session 3, the researcher compared the Feelings Toolkit to another new tool which used smiley faces adapted to the Feelings Toolkit's layout. It was named the Smiley-adapted-to-Feelings Toolkit. The study was conducted by parents with their children in their home environment. The findings of the study revealed that very young children liked the Feelings Toolkit more than the Smiley-adapted-to-Feelings Toolkit. Very young children used the tool in many ways. The tool could be used to assist very young children to express their feelings after interacting with computer products. Comments and suggestions from parents were also used to improve the tool.

A further study was conducted to validate the existing Feelings Toolkit with older children (aged 6) in a kindergarten and at home in Malaysia. The study was conducted in Malaysia to look for any cultural differences. The findings of the study produced a final version of the Feelings Toolkit. The final versions consist of one bipolar adjective only *(good – bad)* using the existing photographs in the Feelings Toolkit on one sheet. The other aspects, i.e. text, size, colour, and layout, remained the same as the existing Feelings Toolkit.

The children's participation in the development phase was based on the Ladder of Participation by Hart (1997). In stages 1 to 5, the researcher involved very young children in the UK as on

rung four (assigned but informed). But in stage 6, the researcher involved older children (aged 6) also as on rung four (see Section 3.3.2).

The children's participation in the evaluation phase was based on rung 4 (assigned but informed) as well. The children were given information about the researcher, the study, and then assigned appropriate tasks in the study (see Section 3.4.1).

The Feelings Toolkit was successfully developed using the methodology of iterative design and participation of children based on the Ladder of Participation (see Section 2.3.3). The Feelings Toolkit is ready to be evaluated in the evaluation phase. This is described in detail in the next chapter.

CHAPTER 5

EVALUATING THE EFFICACY OF THE FEELINGS TOOLKIT

5.1 Introduction

This chapter highlights the evaluation phase designed to evaluate the efficacy of the Feelings Toolkit with very young children. A series of user studies was conducted in two different environments; in a kindergarten and at home. Data were collected through direct feedback and observation as detailed in subsequent sections.

5.2 Conducting User Study

The aim of the study was to evaluate the Feelings Toolkit with very young children aged 3 to 5 years old after interacting with less-fun and fun edutainment courseware. The same kindergarten (see Section 4.2.6.1.1) was chosen as the place to conduct the user study because the kindergarten fulfilled the conditions listed in Section 4.2.6.1.1. For the user study at home, parents among the researcher's colleagues took part in the study. They were chosen based on convenience sampling. The total number of participants that took part in the evaluation was 30 children (12 boys and 18 girls). Two edutainment coursewares were used in this study, courseware1 (C1) and courseware2 (C2).

5.2.1 Apparatus: Courseware

Courseware1 (C1) and Courseware2 (C2) were developed by second semester undergraduate students taking the Human-Computer Interaction (HCI) course. The researcher asked them to develop two coursewares using different platforms and multimedia elements. Both were new and unfamiliar to participants, as in a work conducted by Barendregt et al. (2008) to avoid any bias.

Courseware1 was purposely developed in black and white, with no sound, no video, and no animation, and less interactivity, while Courseware2 was developed with nice colours, background music, video, and 3D animation. The researcher considered Courseware1 as less-fun and Courseware2 as fun. Figure 5.1 and Figure 5.2 show C1 and C2 respectively.

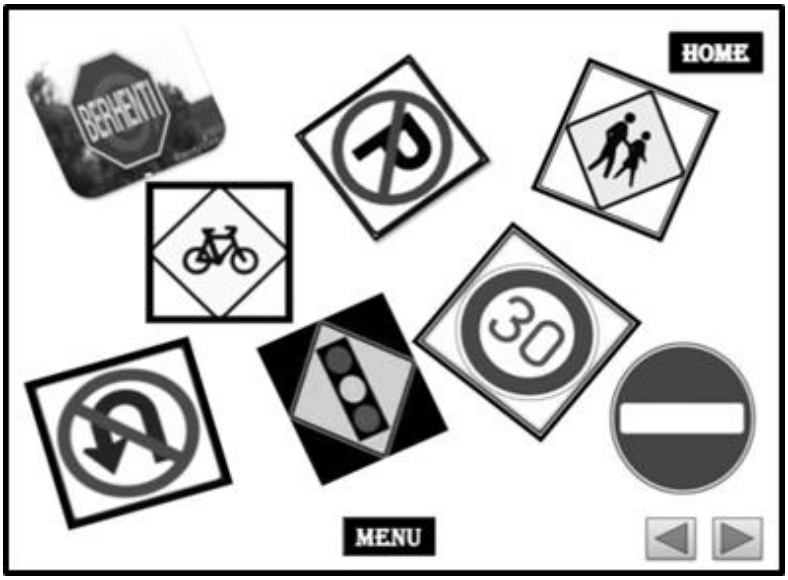


Figure 5.1: Interface of Less-Fun Courseware (C1)

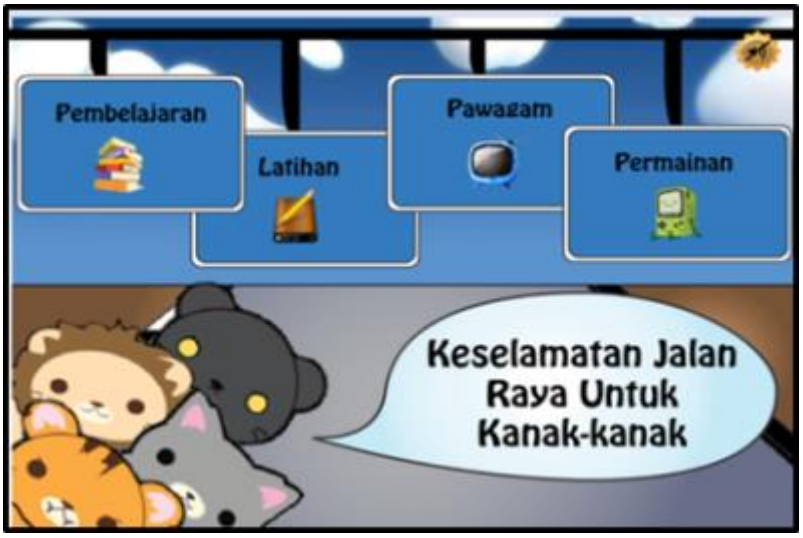


Figure 5.2: Interface of Fun Courseware (C2)

The user study conducted in the kindergarten is described in the next section.

5.2.2 User Study in Kindergarten

The aim of the user study was to evaluate the Feelings Toolkit with very young children in kindergarten aged 4 to 5 years old after interacting with the less-fun and fun edutainment courseware.

5.2.2.1 Participants in Kindergarten

Twelve kindergarten children (3 boys and 9 girls) aged from 4 to 5 years old took part in the study. Two children aged 4 and 10 children aged 5 participated in this study. In Malaysia, early childhood education officially starts at 4 years old. In total, there were 58 children aged 4 and 5 in the kindergarten (see Section 4.2.6.1.1, Table 4.4). Thus, the researcher prepared 58 parental consent forms, but only 12 forms were returned. Many parents did not return the consent form either because they did not want their children to take part in the study or because they simply forgot. It is not easy to enlist participants among kindergarteners.

5.2.2.2 Procedures in Kindergarten

In the study, the researcher's role was assigned as a facilitator giving tasks and asking the children questions, as a writer writing and recording answers, and as a photographer and observer taking photos and observing the children during the study. At the beginning, class teachers helped the researcher by giving instructions to the children to sit down. Then the researcher handled the session.

Before the study started, the researcher told the children about herself and the study. They were informed that they were assisting in the development of a tool that would be used, in future, to evaluate feelings in children. Then the researcher invited them to participate, asking: *"Who wants to take part, please raise your hand".* The researcher identified the children and assigned them turns. The children's participation as in Hart's (1997) rung 4 (assigned but informed) was applied in this study. Only one child was selected at a time to participate in the study. The child was invited to the kindergarten office, where the study was conducted (Figure 5.3). The other children were passed back to the class teacher to be looked after. They continued their lesson in the classroom or did any other planned kindergarten activities. The researcher also informed them that no child was obliged to participate in the study. Thus, the child could leave or stop before or during the study.

Figure 5.3: A boy playing with less-fun courseware in a user study conducted at the kindergarten's office

The researcher let the participants have two rounds to play with the courseware, with one courseware per round. For each round, the researcher first let the child play with the courseware for two to three minutes. Then, the researcher showed both Feelings Toolkit versions to the participant and let them choose the one of most interest. Then the researcher read the introductory statement as stated in the Feelings Toolkit, followed by the required question as instructed in the sheet, and recorded the answer. After round 1 was completed, the researcher and children repeated the same processes for round 2 with the other courseware.

During the study, the researcher followed step-by-step procedures as in Figure 5.4 below.

In round 1: please use Feelings Toolkit labelled with number 1

1. Ask a child to play with **Courseware1** for 2-3 minutes.
2. Show both versions of Feelings Toolkit (W1 and A1) to the child and ask the child which one he/she likes most.
3. Read an introductory statement: "Hi. This is *Wafiy/Alisya* (either one). He/she was playing on the computer just now. He/she feels..."
   "Good" "Don't know" "Bad"
   (While saying these words, the researcher points to the related pictures as well).
4. Then ask the child a question: "How do you feel after playing on the computer"?
5. Point to each picture and say the feelings → start with "Good", "Don't know", and "Bad".
6. Write all responses shown/said by the child in a related box (below).

In round 2: please use Feelings Toolkit labelled with number 2

1. Ask the child to play with **Courseware2** for 2-3 minutes.
2. Show both versions of Feelings Toolkit (W2 and A2) to the child and ask the child which one he/she likes most.
3. Read introductory statement: "Hi. This is *Wafiy/Alisya (either one)*. He/she was playing on the computer just now. He/she feels..."
   "Bad" "Don't know" "Good"

   *THIS TIME REVERSE THE ANSWERS; START WITH "BAD", "DON'T KNOW", AND "GOOD".
   (While saying these words, the researcher points to the related pictures as well).
4. Then ask the child a question: "How do you feel after playing on the computer"?
5. Point to each picture and say the feelings → start with "Bad", "Don't know", and "Good".
6. Write all responses shown/said by the child in a related box (below).

Figure 5.4: The step-by-step procedures used in user study in kindergarten

The researcher used a within-subjects design for the trials, which automatically controls for individual variability (Nielsen, 1993); all participants performed the tasks on both coursewares trialled. This was done to ensure that any factors that might affect the participants' overall performance and preferences would be the same for both games trialled. In order to lessen the learning transfer effect, the researcher used a counterbalancing approach (Sharp et al., 2011); participants in group A trialled courseware1 first, while participants in group B trialled courseware2 first, as depicted in Table 5-1.

Table 5.1: The trial design for the study

Group	First Courseware Trialled	Second Courseware Trialled
A	Courseware 1 (Less-fun)	Courseware 2 (Fun)
B	Courseware 2 (Fun)	Courseware 1 (Less-fun)

The researcher recorded the data and then coded the data into Microsoft Excel. The results of the user study conducted in the kindergarten will be explained in Section 5.2.4 together with the results of the user study conducted at home. The next section focuses on the user study conducted at home.

5.2.3 User Study at Home

The aim of the user study was to evaluate a new version of the Feelings Toolkit with very young children aged 3 to 5 years old in the home environment after interacting with the less-fun and fun edutainment courseware.

5.2.3.1 Participants at Home

For convenience purposes, to recruit participants, the researcher randomly telephoned (using a telephone directory) and invited parents, as in Section 4.4.2.1, but this time the researcher invited colleagues from nearby departments. Eighteen children (9 boys and 9 girls) aged from 3 to 5 years old participated at home in the user study. Only two children aged 3 years, six children aged 4 years, and 10 children aged 5 years took part in the study. So most of the children participating in this study were 5 years old.

5.2.3.2 Procedures at Home

In the study, the researcher distributed an envelope containing an instruction sheet, the two Feelings Toolkit versions (labelled as W1 (*Wafiy*/boy) and A1 (*Alisya*/girl), one CD (installed with two coursewares, entitled Courseware1 and Courseware2), and a consent form to be filled in by the parents. An instruction sheet for the step-by-step procedure to guide parents on how to conduct the study with their children at home was also included. A similar procedure to the study in the kindergarten depicted in Figure 5.4 followed in this study. Figure 5.5 depicts a girl taking part in a user study at home.

Figure 5.5: A girl taking part in a user study at home

The researcher asked parents to let the participants have two rounds to play with the courseware, one in each round. For each round, the parents first let their child play with the courseware for two to three minutes. Then, the parents showed both Feelings Toolkit versions to the child and let them choose the one of most interest. Then the parents read the introductory statement as stated in the Feelings Toolkit, followed by the required question as instructed in the sheet, and recorded the answer in the Feelings Toolkit. After round 1 was completed, the parents and children repeated the same processes for round 2 with the other courseware.

The data were recorded by the parents and, once completed, were submitted to the researcher. Then the researcher coded the data into Microsoft Excel.

5.2.4 Results and Discussion of the User Study

Data were collected through direct feedback and observation.

5.2.4.1 Results from Direct Feedback

User Study in Kindergarten: Data were gathered from 12 participants. The result, as depicted in Figure 5.6, shows that all six participants from both group A and group B ranked courseware2 (Fun) as "good". No participant responded "don't know" or "bad" for courseware2.

For group A, where the participants trialled C1 (less-fun) first, there were mixed views of "good" and "don't know" for C1. But, after the participants played with C2, they only perceived C2 as "good".

For group B, the 'fun' C2 was played first and received "good" scores from all participants. Having played the fun courseware first (C2), one participant ranked C1 as "don't know" and five of the six participants still thought C1 was "good".

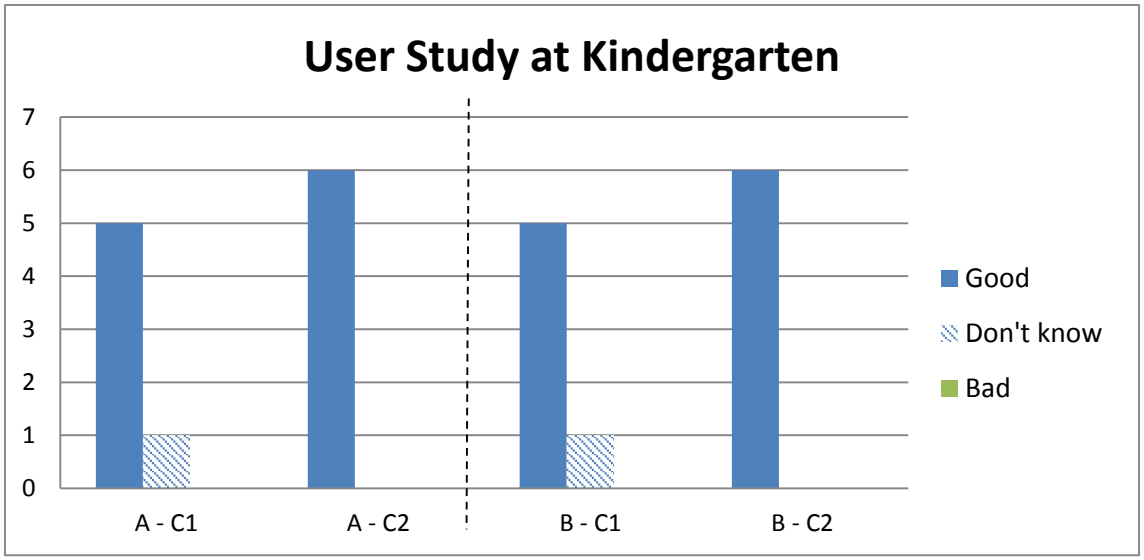


Figure 5.6: Results of Less-fun courseware and Fun courseware between Group A and Group B (Kindergarten)

Appendix M depicts the detailed data for the study in the kindergarten.

User Study at Home: Data was gathered from 18 children. The result, as depicted in Figure 5.7, shows that, regardless of the order in which the courseware was trialled, all nine participants from both group A and group B ranked courseware2 (Fun) as "good". No participant responded "don't know" or "bad" for courseware2.

For group A, where the participants trialled C1 (less-fun) first, there were mixed views of "good", "don't know", and "bad" for C1. But, after the participants played C2, they only perceived C2 as "good".

For group B, the 'fun' C2 was played first and received a "good" score from all participants. Having played the fun courseware first (C2), six of the nine participants ranked C1 as "bad" and two still thought of C1 as "good".

The researcher believes that participants still thought C1 was "good" because some children just liked to play with anything that is interactive. The results showed that children can differentiate between good design and bad design and their experience of a less-fun courseware and a fun courseware. This indicates that the Feelings Toolkit is efficacious and can help developers to evaluate very young children's feelings.

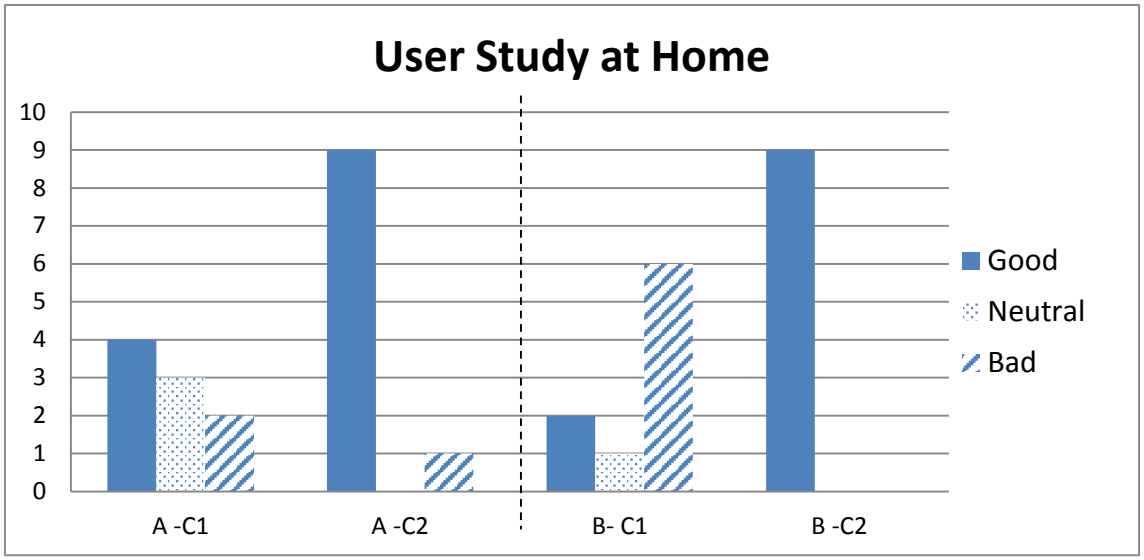


Figure 5.7: Results of Less-Fun courseware and Fun courseware between Group A and Group B (Home)

Appendix N depicts the detailed data for this study.

5.2.4.2 Results from Observation

Several main observations that are considered important are:

Computer skills and family background

Several children have good computer skills and play various games at home. They are smart enough to identify good and bad design in both edutainment coursewares (less-fun and fun). Their good skill at using the computer and wide exposure to computer products are influenced by their family background.

Versions of the Feelings Toolkit they liked most

Ten children consistently chose a boy version (*Wafiy* Feelings Toolkit) and 11 children consistently chose a girl version (*Alisya* Feelings Toolkit) in both rounds. They chose a version that matched their own gender. However, two girls at home (P4 and P13) consistently chose the boy version (*Wafiy* Feelings Toolkit). Even though the number is small, it is indicated that gender is not important to very young children in both environments when selecting the tool that they liked most.

Methods of children using the Feelings Toolkit

Children used many methods to use the Feelings Toolkit, pointing to the related photograph, verbalising word(s), and nodding their heads, or imitating hand gestures, as described in Sections 4.2.3.1.2, 4.2.4.1.2, 4.2.5.1, 4.2.5.2, and 4.2.5.3.

In this study, most children in kindergarten pointed to the related photograph and some children also verbalised "*good*" when using the tool. Very few children elaborated their answers. For example, in round 1, P4 said:*"I like the game…".* The same participant said *"because this game is good.."* in round 2.

But, many children at home not only used normal ways to interact with the tool but voiced their opinions as well. The participants elaborated their answers. For example, in round 2, P10 said *"I feel good because I can change clothes, match jigsaw, and lots of pictures. I feel good because it's like a story…good because so many things there; writing, pictures, story...".* Another participant, P15, said: *"Good…when I press (click), there is Tom & Jerry song..".* Children at home were more open and confident to use the tool with their parents. Rich data and interesting data could be gathered at home when parents conducted the user study with their children at home.

5.3 Summary

This study outlines the evaluation of the Feelings Toolkit, an evaluation tool developed to evaluate very young children's feelings. The Feelings Toolkit is a paper-based evaluation tool developed for very young children (aged 3 to 5 years old) to assist them in expressing how they feel after playing with computer products. The user study conducted reveals that the new Feelings Toolkit can be used by very young children to express their feelings after interacting with edutainment courseware.

This indicates that the Feelings Toolkit is efficacious and can help the developer to evaluate very young children's feelings. The next chapter will discuss the experience of working with young children.

CHAPTER 6

EXPERIENCES OF WORKING WITH YOUNG CHILDREN

6.1 Introduction

This chapter discusses the experience of working with young children throughout the PhD research. It starts with a discussion of child development issues, followed by discussion of the challenges of working with very young children, methodological problems, and strategies to use when working with very young children. Finally, this chapter discusses suggestions for conducting user studies with very young children.

6.2 Child Development Issues

Due to children's cognitive limitations (see Section 2.3.1), researching with very young children was challenging and unstructured but obviously was fun. Very young children were natural and spontaneous. Physically, they were so fast and very active, explorative, and curious. They demanded lots of attention and time. It happened sometimes that the researcher did not get any data during a visit to the nursery because no children wanted to participate in the evaluation session. They just wanted to play with the computer and interacted with the researcher but did not want to choose an evaluation tool or answer questions. Sometimes the opposite situation happened, when too many children were interested in participating in the studies but time was very limited due to nursery activities. Thus, researching with nursery children can sometimes take longer than originally planned.

The research was originally planned to be conducted in the nursery for one year but it took nearly two years. It started with a preliminary study which was conducted in May 2009 and it ended with exploratory sessions conducted in February 2011. The extra time needed to finish the research was not only because of child development issues but also involved other factors including uncontrolled factors like ill health (see Section 6.3.5) and the weather (see Section 6.3.6).

It is recommended to use appropriate strategies (see Section 6.5) to design flexible study plans (see Section 6.6.1), and to allocate enough time to allow changes in certain aspects when researching with very young children.

6.2.1 Cultural Issues

The education system and school setting in the UK are different from Malaysia. In this research, the nursery school is located in Glasgow, Scotland. The school follows Scotland's education curriculum, known as the Curriculum for Excellence. The curriculum emphasises playing. Kindergarten in Malaysia follows the National Preschool Standard Curriculum. The focus is more on preparing children for primary school. The curriculum emphasises learning.

The nursery setting is full of children's play things, i.e. toys, storybooks, and is provided with a computer. The kindergarten setting is classroom-based with teaching and learning materials. No computer is provided for the kindergartener's use. The computer is available for administrative purposes only. The Malaysian kindergarten children wear uniform to school. They pay school fees and are provided with stationery and exercise books. They are taught subjects such as languages (Malay and English), mathematics, and science and sit examinations.

The cultural differences have an impact on the research. For example, in Section 5.2.4.1 it was found that some kindergarteners in Malaysia had positive feelings after interacting with "less-fun" edutainment courseware. The assumption is that the children had the positive feeling after interacting with the computer itself, not with the product. The "less-fun" courseware does not affect them. One reason may be that the children's access to a computer is limited at home. Thus the children might rarely have a chance to play/interact with computer products. There could be other reasons for this finding, but, without further investigation, this cannot be identified.

6.2.2 Very Young Children versus Young Children

Children aged 3 to 5 years old who attended nursery and participated in a preliminary study were found actively playing with indoor and outdoor things. Many children's materials such as toys, books, bikes, and others were provided in the nursery. The children were allowed to play or do any activities either individually or in groups. The numerous activities included painting, singing, storytelling, dancing and exercising, playing with sand, constructing wooden puzzles, and so on. Therefore the nursery children were always on the move.

They could not focus on doing or playing one particular activity for a long period unless they were engaged with it, e.g. playing on the computer. Obviously it was difficult to get data from the nursery children. They could easily feel bored, did not understand some questions, could not

necessarily reason about their experience, might experience language barriers due to limited vocabulary and might have physical limitations such as hand and eye coordination in using computers.

However, the study conducted at the primary school with five volunteer participants (aged 5 to 6 years old) indicated that there were possible differences when working with children of different ages. The primary school children were more focused and settled well in a classroom. They had lessons to learn and the teacher easily handled and taught the children. Sometimes they actively participated in the teaching and learning activities by raising their hands or answering questions. The researcher asked them to play on the computer, interviewed them, and asked them to draw. They cooperated well during the study. Young children at primary school are more confident, can easily understand questions and instructions, and also have better communication skills.

Table 6.1 summarises the challenges working with the two different age groups of children in two environments. The nursery children were found to be more challenging but worthwhile to research with compared to the older children in the primary school. This is because research with this group has rarely been done due to the challenges mentioned above. Regardless of the challenges, the decision was made to continue this research in the nursery environment.

Table 6.1: Findings of working with children in different environments

Nursery Children (3-5 years old)	Primary 1 Children (5-6 years old)
• Easily feel bored. • Do not understand questions. • Cannot reason easily about products. • Language barrier. • Physical limitations – hand and eye coordination.	• More confident. • Easily understand instructions. • Have better communication skills.

The study conducted in Malaysia involved older children aged 6 in validating the existing Feelings Toolkit and involved very young children aged 4 to 5 in evaluating the efficacy of the Feelings Toolkit. Children aged 3 were not considered in the study because pre-school in Malaysia starts at 4 years old. The very young children involved in this research were recruited from one kindergarten and the researcher's colleagues. The older children, aged 6 were also

recruited from the same kindergarten and the researcher's colleagues. In Malaysia's education system, 6-year-old children still go to kindergarten.

The next section discusses the challenges of working with very young children.

6.3 Challenges of Working with Very Young Children

Working with children in a nursery is not the same as in other places like school or at home, especially when research is done over a long period. The researcher took nearly two years, from May 2009 until February 2011, to carry out the research in the nursery.

Several challenges were identified when conducting research with very young children in a public nursery school. The challenges are discussed in six aspects; stakeholder (adult) participation, children's participation, nursery activities, bureaucracy, ill health, and weather.

6.3.1 Stakeholder (Adult) Participation

According to Preece et al. (2002), stakeholders are a group of people who have a stake in the development of a successful product and these people are many compared to the direct users of a particular product. The authors list stakeholders such as a development team and manager, user and manager, competitors and staff, and others. They give an example of creating an electronic calendar system where the direct user is a reader but where other stakeholders are affected by introducing the calendar, such as people with whom the reader makes appointments and stores birthdays, and also companies that produce the printed calendars that compete in the same industry.

In this research, the stakeholders identified are very young children and parents, nursery staff and head teachers, and the researcher. The researcher groups the stakeholders into two groups, children and adults. The children become the users of the newly developed evaluation tool. The adults are people who manage and are very close to the children in the nursery and at home.

The researcher worked with four different head teachers and two team leaders (including permanent, temporary, and acting) from the preliminary study in May 2009 until completing the exploratory sessions in February 2011. The first head teacher retired when the nursery opened for the new session of 2009/2010, which started in August 2009 so the researcher only met her a few times before she retired. The head teacher asked the researcher to work closely with a team

leader. The second head teacher (temporary) started working in the nursery from August 2009 until March 2010 and asked the researcher to continue the research in the same way as she had done before. The third head teacher (acting) served from March 2010 until June 2010 and was involved in giving feedback and suggestions about the initial tools developed in this research. Finally, the fourth head teacher (permanent) joined the nursery in June 2010. The researcher worked closely with the first team leader from the beginning of the research until June 2010. A new team leader (acting) was appointed in August 2010.

Different head teachers and team leaders have different management styles. For example, the second head teacher allocated time and was willing to discuss the findings of the testing of the Pictorial Feelings Toolkit. She seemed familiar with research with very young children and gave interesting feedback. The second team leader had graduated in childhood studies from a university in Glasgow and was a knowledgeable person in working with very young children. The head teacher and the team leader were involved directly in this research. They contributed ideas, advice, feedback, and suggestions. Other head teachers and team leaders helped the researcher in many different ways. Not only their styles, but their ideas were different.

A new nursery management changed the nursery layout/setting. The computer area was re-arranged from room 1 to room 4 in September 2010, so while previously the studies were conducted in room 1, from November 2010, they were all conducted in the new area, room 4. Only one computer connected to the internet was available in room 4. Another computer was moved to the head teacher's room for administrative work. A big colour printer and a desk were also moved from that area. One small square table with four chairs was placed not far from the computer desk. The computer area was more spacious than usual.

6.3.2 Children's Participation

The children's participation in the research was based on Hart's model (see Section 2.3.3). Their participation in the development phase is explained in Section 3.3.2 and their participation in the evaluation phase is explained in Section 3.4.1.

The children's participation in the research was on a voluntary basis. They could participate in a user study either completely or partially and could withdraw from the study at any time, as stated in the parental consent form. Getting very young children to completely participate in the study was difficult and challenging due to their shorter attention span compared to adults, and to

other factors as discussed in Section 6.2. Furthermore, some children just wanted to play on the computer but not to answer questions.

For example, in Section 4.2.4.1, a series of studies to test the *Alisya* Feelings Toolkit was conducted in the UK nursery. Fifteen children voluntarily participated in the studies (12 boys and 3 girls), but only 11 responses were gathered from the studies because four children took part in only half the test; three children played on the computer but did not want to answer questions and one participant answered questions unclearly. As highlighted in Section 6.3.4.2, a nursery is a busy and interesting place for very young children to explore indoor and outdoor activities. Children might prefer other interesting activities rather than interacting with the computer. The biggest challenge conducting studies in the nursery with very young children was to get the children's complete participation in a very limited time.

Not only children's participation, but nursery activities also made the study challenging as described in detail in the next section.

6.3.3 Nursery Activities

A nursery is a very busy place with lots of activities either indoors or outdoors. Figure 6.1 shows children enjoying some of these activities at the nursery. Sometimes special events were planned for the children. For example, activities for March 2009 were: celebrating Red Nose Day on 12th, outings to Kelvingrove Museum, Glasgow on 2nd, 4th, 9th, and 18th, Literacy Week where on 10th a professional storyteller came to the nursery, face-painting activities, and a storytelling session on 30th. Besides, some children performed nursery rhymes in English, Urdu, and Punjabi at the Glasgow Music Festival on 15th March at the Royal Concert Hall. On 29th there were group photographs and finally an Easter Party was held on 31st March before the nursery was closed for the Easter/Spring Holiday from 2nd to 16th April 2009. Therefore, a first, preliminary study was conducted after the Easter Break.

Figure 6.1: Children enjoying indoor and outdoor activities in nursery

The nursery has two sessions. The morning session is from 8.45 am until 11.45 and the afternoon session is from 1.00 pm until 4.00 pm. The research was conducted with morning session children on the assumption that children are more active and alert in the morning.

Table 6.1 shows daily activities for the morning session in the November 2010 planner which were prepared and displayed on the noticeboard to inform parents of the children's daily activities. This planner was introduced when the final head teacher started working in the nursery. Previously, parents were informed about their children's activities through a monthly newsletter.

Table 6.2: Daily nursery activities in November 2010 (morning session)

08.30am	Full-time children arrive and sign in with key worker.
08.30 – 08.45am	Free play.
08.45am	Children arrive and sign in with key worker.
09.00 – 09.15am	Group Welcome Time Welcome children at seated area for signing in register and welcome song. Planning Time Children offered choice of planned experiences throughout the nursery and encouraged to discuss individual learning plans for the day.
09.15 – 10.40am	Children's choice of free play and planned activities.
09.45 – 10.40am	Snack
10.40am	Tidy up music
10.50am	Group tooth brushing
11.00 - 11.30am	Group gathering time
11.30 – 11.45am	Children going home

Note: * 09.45am – ongoing snack bar (children's choice) everyday
* Only on Wednesday - sit down snack with groups (15 minutes)

Starting from November 2010, the study with the children was conducted from 9.30 am until 10.20 am during the "children's choice of free play or planned activities". The time chosen seemed to clash with snack time which is from 9.45 am until 10.40 am. But from November 2010 snack time was optional. Children had an on-going snack bar every day except on Wednesday. They were given options to take a snack or not except on Wednesday, when they had a snack with their groups.

According to the new team leader, the idea was to educate the children to be independent and responsible. Previously, every day the children had a snack with their own groups. The new planner did not affect the duration of conducting studies in the nursery. Section 6.5.1.3 will discuss more about the duration of study in the nursery. Research in a nursery must follow the activities planned in the nursery, whether planned ahead or at short notice.

Bureaucracy and procedural matters can also be challenges when working with very young children. The details are discussed in the next section.

6.3.4 Bureaucracy and Procedural

The researcher needed to ask permission from the children and adults. A parental consent form was printed and submitted to the nursery team leader a week before the preliminary study was conducted on 29 May 2009. As explained in Section 3.2.1, the team leader volunteered to be in charge of distributing and collecting the consent forms as the researcher was new to the nursery. After a few days, the researcher followed up with the team leader and was informed that only a few parents (without mentioning specific numbers) had returned the form. The researcher was allowed to conduct the preliminary study on condition that anonymity was applied. Consent was given by the nursery staff on the children's behalf.

When the second head teacher started work at the nursery, the researcher met and briefed her about the research. The head teacher told her to continue the research by following all the previous procedures. During that period no consent form was distributed since no studies were conducted. When the third head teacher started work, the researcher met and briefed her about the research and asked about distributing parental consent forms. The head teacher disagreed, on the basis that the researcher was given consent by the nursery and the research involved volunteer children only. When the final head teacher started at the nursery two weeks before the summer holidays, the researcher met and briefed her about the research. The head teacher gave permission to proceed with the study.

The new team leader asked the researcher about the parental consent forms because the forms could not be found in the nursery filing system. Besides, only 25 children from the previous session (2009/2010) had returned the forms to the nursery. Therefore the researcher was asked to distribute forms to all parents (Appendix O) and was furthermore asked to prepare a children's consent form for any children who wanted to participate in the study (Appendix P).

The researcher prepared 80 consent forms and distributed them to parents. It took two days to settle the consent forms. The nursery is open at 8.30 am for full-time children and 8.45 am for other children. The researcher waited from 8.30 am at the main door near to the janitor, registration notice board and cloakroom. Every day parents had to sign in and out for their children's attendance at the noticeboard and go straight to the cloakroom to hang up their child's jacket and other possessions. When the janitor opened the main door, the researcher quickly approached and briefed parents about the study and the form because of time restrictions. The researcher provided a pen and space for them to fill in the forms. Actually, the area was quite small and busy but very strategic to get the parents' attention.

On the first day, only 65 children attended the nursery. This information was gathered from the noticeboard after the morning session ended. As the researcher observed, not all children attended the nursery every day for a variety of reasons; sickness, being late, long holidays, and so on.

Thirty-one parents filled in and submitted the form on the first day; many submitted the form on the spot and some brought it back at 11.45 am, when they came to collect their children. Eight parents, including a few mothers, took the form away and submitted it on the second day for various reasons; in a hurry to go to somewhere, had difficulties understanding English, did not know how to fill in the form, or wanted to take the form home so that their spouse could read and understand the content first. On the second day, another 22 parents filled in and submitted the form.

In total, the researcher received 61 forms from parents allowing their children to participate in the study and one form from a parent who did not wish her child to participate in the study for personal reasons.

In total, it took two days to get back 62 parental consent forms for the reasons outlined above. Besides, time and space restricted the process of distributing and collecting in all the parental consent forms on the same day as intended. There was a different requirement about parental consent forms from the nursery management. However, the researcher had fulfilled the consent

requirement as recommended by Markopoulos et al. (2008) to get appropriate consent from a parent or responsible adult.

The researcher did not apply for photographic consent explicitly and separately from the consent form distributed to parents as suggested by Markopoulos et al. (2008). In April 2010, the head teacher allowed the researcher to photograph the models' faces while doing indoor and outdoor activities. But the photographs were restricted to reports, this thesis, and academic publications. This is because very young children are a vulnerable group who need to be cared for and protected. The team leader reasoned that some parents did not want their children to be photographed and they might sue the nursery if this happened. The researcher made the mistake of not applying for consent from the Local Education Authority and Department Ethics Committee to photograph nursery children before starting the research.

Ill health can be a challenge when working with very young children. Details are discussed in the next section.

6.3.5 Ill Health

Swine influenza (or swine flu) hit Britain and other countries around the world like Mexico, Australia, New Zealand and Israel. Influenza is a viral infection which affects the respiratory tract. Normally the virus can be found in animals, such as pigs, but it can be spread through hand contact, coughing and talking. Symptoms of human swine flu are fever, a cough or runny nose, sore throat, headache, fatigue, diarrhoea or vomiting.

On Thursday 28th May 2009, parents of children in Primary 1 at a nearby primary school were called and briefed about the swine flu case. One child in Primary 1 was suspected of having H1N1 (swine flu virus). As a precaution, the school was closed until 9th June 2009. To reduce the chances of the children getting infected by the virus, all children in Primary 1 were given *Tamiflu*, an antiviral to be taken for 10 days.

This school is very close to the nursery, less than 0.5 miles away, so this had an impact on the children's attendance at the nursery. Some parents decided not to send their children to the nursery on Friday 29th May 2009. This affected the number of children that could participate in the study. Markopoulos et al. (2008) suggest preparing a good plan: always assume that some children will not attend and design the evaluation to limit the effect of no-shows. A suggestion to design a flexible study plan is thus discussed in Section 6.6.1.

Besides, the weather can also be a challenge when working with very young children. Details are discussed in the next section.

6.3.6 Weather

In December 2010 heavy snow affected Glasgow and the UK in the worst winter for 20 years. Universities, school, and nurseries were closed for safety reasons and due to limited public transport. Studies planned earlier were cancelled. On 3rd December 2010 only 32 children attended the nursery. Regardless of the small number of children attending, a study to test the *Alisya2* Feelings Toolkit was still conducted.

During the summer, many toys and children's materials were set up outside the nursery which attracted the children to play outdoors. One staff member mentioned that they encouraged the children to play outside because the majority of them lived in flats, so attending the nursery was a chance for them to play and enjoy outdoor activities. Different weather had an impact on the number of children participating in the studies. Fewer children attended the nursery during heavy snow or on bright and sunny days.

As expected, problems may occur when working with very young children. In the next section, the problems are classified as methodological problems.

6.4 Methodological Problems

Research with children is different from research with adults (Punch, 2002). Some methodological problems were identified when working with very young children; assigning adult roles, the computer platform, venue of study, duration of study, and procedures of study.

6.4.1 Assigning Adult Roles

In this work, the researcher needed to identify the adults' roles and responsibilities before starting the research with very young children because these people have direct responsibilities for the children.

However, the researcher made the mistake of not defining the roles of the nursery staff and involving them in conducting the studies. The researcher should have assigned them specific

roles in a working paper submitted earlier. Consequently, they could not be directly involved and help the researcher during the studies because they had their own work and responsibilities. It was difficult to ask for their help because they had to monitor the children and complete their daily jobs.

Sometimes a few staff members tried to help the researcher organise the children's turns and persuade the children to stop playing on the computer if the situation was uncontrolled. The staff voluntarily helped the researcher if they wanted to, but not because of any responsibility or obligation. Conducting research with children in a nursery which has 80 children was not easy and was very challenging without recruiting enough adults to facilitate activities (Markopoulos et al., 2008). The nursery staff's roles should be identified earlier to involve them in this research.

In the home environment, the situation was easier because parents were willing to help and were involved directly in the user studies. Parents of participants delegated jobs. For instance, a father became a facilitator, observer, and note-taker while a mother became a photographer or vice versa. Figure 6.2 shows a father playing many roles in a user study which was conducted at home. Some parents could easily conduct the study individually. They asked their children to play on the computer, asked questions, wrote comments and feedback, and finally took photographs of their child.

Figure 6.2: A father playing many roles in a user study which was conducted at home

Some nursery staff misunderstood the researcher's role because it was the first time the nursery had had a computing PhD student doing research with very young children there. Normally,

they received training students from various colleges who were studying related courses such as Childhood Education. Consequently, the researcher was given a student induction pack by the new nursery management, even though this was intended for full-time training students. But the researcher in fact found the information helpful, if not wholly relevant.

The best way to inform the nursery staff about the researcher's role is by visiting the nursery regularly and communicating with them frequently. This should be done especially at the beginning of the research. They can help and guide the researcher and also provide useful and important information. Besides, it will help the researcher to feel comfortable and accepted. It is very important to know as many staff as possible and not to rely on one individual because some staff may leave the nursery. Even though the nursery staff were very busy with their jobs, they were approachable especially during tea break.

It is also recommended to ask permission from authorised staff before helping any staff member, or involving them in any nursery activities, because there are rules and regulations that must be followed.

6.4.2 Platform: CBeebies Website Interface and Content

The CBeebies websites is dynamic, meaning the interface and content are updated regularly according to the TV programmes. Figure 6.3 shows the current *home* interface of the CBeebies website. Figure 3.2 shows the previous *home* interface of the CBeebies website. For example, using the new interface, children will be asked to choose any games under the *CBeebies Show* icon in Figure 6.3. And using the previous interface children were asked to choose any games under the *Fun and Games* link in Figure 3.3. However changes to the website interface and content did not affect the study. Children were asked and allowed to play/explore any game they liked that was available on the websites.

It is highly recommended that researchers who want to use the CBeebies websites in a study should regularly familiarise themselves with the website interfaces and content. This can be done by playing/exploring the games in the website with children, and will help the researcher to assist the children if they get stuck or ask questions about the website.

Figure 6.3: The home page interface of the CBeebies websites (date 18/05/2012)

The number of computers used during the studies changed according to the research or nursery requirements. For example, in the preliminary study only one computer was used although three computers were available in room 1, so the researcher was able to control the situation. A child played on the computer and then the researcher interviewed the child. But in the studies to test the Smiley Feelings Toolkit (see Section 4.2.1.1), Pictorial Feelings Toolkit (see Section 4.2.2.1), and the *Wafiy* Feelings Toolkit (see Section 4.2.3.1), two computers were used as a strategy to get more participation from the children.

Using more than one computer had disadvantages. It made the researcher very busy when conducting the studies: she had to play many roles at the same time - as a note-taker, facilitator, and observer simultaneously as well as organizing the children's turns, and had to synchronise the turns of participants and potential participants in the studies.

6.4.3 Venue of Study

The place where the study was conducted changed according to nursery requirements (renovation). For instance, in September 2010, the computer area was moved from room 1 to room 4 as explained in Section 6.3.4.1. In room 4, only one computer connected to the internet was provided by the nursery. Therefore, the studies to test the *Alisya* Feelings Toolkit (see Section 4.2.4.1) and *Alisya2* Feelings Toolkit, and also exploratory session 1 (see Section 4.2.5.1), which were conducted in November to December 2010, used only one computer.

6.4.4 Duration of Study

The time taken to complete each study was different. For example, the preliminary study took more than an hour because each child was allocated 15 minutes to play on the computer and answer 10 open-ended and closed questions (see Section 3.2.3.4). The study targeted a group of a maximum of five children for a maximum of 75minutes. But the study finished 15 minutes earlier with four children having participated in the study.

For instance, the time taken to complete testing of the Smiley Feelings Toolkit and the Pictorial Feelings Toolkit was more than an hour. The study followed the same study plan as the preliminary study except that the children were asked using the Feelings Toolkit which consists of four bipolar adjectives only, so with fewer questions than in the preliminary study.

However, studies for testing the *Wafiy* Feelings Toolkit, *Alisya* Feelings Toolkit, *and Alisya2* Feelings Toolkit took less than an hour. This was because each child was allocated 10 minutes to play on the computer and then asked questions by the researcher using the Feelings Toolkit. The study targeted a group of five children for a maximum of 50 minutes. The time planned to start the study was 9.30 am with the end at 10.20 am. However, some studies started late due to several constraints such as children being busy with special planned activities as explained in Section 4.2.3.1. This happened in the study to test the *Wafiy* Feelings Toolkit.

When testing the *Alisya* Feelings Toolkit, the study started late at 9.50 am because one of the nursery staff was using the computer for an administrative job. The same happened when testing the *Alisya2* Feelings Toolkit. One staff member was using a computer in one room with a group of children to learn about *Our Favourites Animal* topic from 9.30 am so the study started late at 10.10 am.

6.4.5 Procedures to Organize Children's Turns

A number of procedures to organize the children's turns were used to smooth the study conducted with very young children, such as using a timer, persuading children nicely, and introducing different chairs. In the study to test the Smiley Feelings Toolkit, the researcher used a *10-minute-Tickit Timer* to organise the children's turns. For instance, in one study, there was one child who played the *Bob the Builder* Game. Then a second child came up and wanted to play on the computer. The researcher persuaded the second child to wait for his turn and be patient by showing the *10-minute-Tickit Timer* and explaining how it works. When all the sand has fallen down, it will be his turn. But the second child insisted on playing on the computer. It

seemed that *10-minute-Tickit Timer* did not work with the second child. Alternatively, the researcher persuaded the first child to stop playing the game and placed him on the next chair, not facing the computer. The researcher showed the evaluation tool but the first child only answered half of the questions and left the computer area with an unhappy face.

The researcher introduced a new procedure to organise the children when testing the *Alisya* Feelings Toolkit, as explained in Section 4.2.4.1.1. Even though the new procedure was introduced, the researcher took 20 minutes to organise the children's turns in the study to test the *Alisya2* Feelings Toolkit. This was a busy day at the computer area when eight children were gathered at the area. There was only one computer available and one boy was playing on the computer when the researcher arrived. He was playing *Something's Special – Mr Tumble's Star Game*.

The researcher had difficulty controlling some nursery children, some of whom sat on the computer desk. Some children pointed their fingers to the computer screen which disturbed the concentration of the boy playing the game. Some children just wanted to watch their friend playing. Finally, the researcher managed to start the study at around 9.40 am (10 minutes late) after organizing the children's turns.

The researcher allowed some children to play on the computer as a group even though this was not stated in the procedures of study. For example, in the preliminary study, the researcher approached two children outside the nursery building. They looked like close friends because of hanging around together. The researcher persuaded them to come inside and play computer games. At first they did not want to join the study. The researcher left them and went inside. After a few minutes, both children came in and participated in the study. At the same time, a few other children came up to the computer area.

Then one of the children sat down and started playing the *Tweenies* games. After that, his best friend joined in and played the same game. The researcher gave a space and a chair to this child. They played a two-player game and finally the researcher asked a few questions in *Malay* language. They talked a lot and looked comfortable compared to before the start of the study. They answered most of the questions except two difficult ones. Sometimes, nursery children were less confident playing on the computer individually, especially if it was the first time. They needed a friend and preferred to play in a group.

Several methodological problems were identified when working with very young children. Some of these problems should not be repeated by other researchers.

Several strategies were applied to work with very young children. The strategies are discussed in the next sections.

6.5 Strategies to Work with Very Young Children

At the beginning of the research, several strategies were employed by the researcher to work with nursery children in the UK. The strategies applied were: singing songs, playing together, reading story books, dressing casually, and joining in indoor and outdoor activities.

In making friends with the children, the researcher sang some songs from the CBeebies website and some few nursery rhymes: *Balamory*, *Big Cook Little Cook*, *Chuggington*, and *Incy Wincy Spider*. The songs were familiar to the children from watching the CBeebies TV channel and playing with the website. The children always sing nursery rhymes at the nursery with the staff. The singing strategy became an ice-breaking session between the researcher and the children.

In addition, some activities were done by the researcher to build a good relationship with the children. For instance, the researcher volunteered to do storytelling and play cards with the nursery children. The researcher volunteered to help a Bilingual Teacher conduct the activities in the researcher's mother tongue, the *Malay* language, during Literacy Week. The researcher read two storybooks entitled *When the Tiger Came to Tea (by Judith Kerr)* and *The Three Billy Goats Gruff*. Then the researcher played animal cards with the children. The children were introduced to a few animals in the *Malay* language such as *harimau* (tiger). These activities helped the researcher to work with the children better.

Besides, communication between the researcher and the children happened through playing. The researcher frequently played on the CBeebies website with the children. The researcher observed most of the popular games that the children liked to play on the website. If the children were stuck or had problems while playing, the researcher helped them, learning and playing the games with them. This strategy helped the children to feel comfortable working with the researcher and to accept her in their environment.

Another strategy used by the researcher was to dress casually like the nursery staff. The researcher observed that it was important to dress casually because working with very young children needs many aspects to be considered, particularly their safety and comfort. The researcher wore a simple plain blouse or shirt with trousers or a skirt in striking colours to make

her easily noticed by the children. Besides, the researcher chose to wear flat shoes, making it much easier to mingle and play with the children.

In familiarising herself the children, another strategy applied was to join in indoor and outdoor activities. The researcher asked the team leader's permission to join the children and staff playing outdoors on sunny and bright days. The researcher also asked the team leader's permission to help serving snacks for one group. At that time, the nursery was short of staff. The researcher helped the group by distributing tissue, milk, fruit, and also plastic cups for children who wanted to drink water. The staff's actions were imitated by the researcher. The researcher's intention in helping with these activities was to familiarise herself with the children.

All these strategies were deliberately applied by the researcher to familiarise herself with the children.
Less strategy was applied by the researcher to work with very young children in Malaysia because the nursery setting in Malaysia is different from the UK, as discussed in Section 6.2.2.

Besides the strategies applied by the researcher to work with very young children, a few suggestions were proposed to conduct a user study with children, as discussed in the next section.

6.6 Suggestions to Conduct User Study with Very Young Children

Conducting a user study with very young children should be done in a flexible way and the researcher should have correct attitudes towards very young children. The study should be carefully planned and provide flexibility because of the methodological problems that are discussed in Section 6.4. Discussion of the study plan is highlighted in the next section.

6.6.1 Flexible Study Plan

The study plan must be flexible and adjustable according to the current situation and nursery requirements, because sometimes unpredictable thing happen in the nursery. The researcher changed the study plan in terms of the number of participants involved, the number of computers used and the platform, duration, and procedures followed.

In conducting exploratory research, the number of participants is not rigid. All children with consent from the nursery and parents were allowed to take part in the study. Actually, this way is fairer, giving each child the same opportunity to participate in the study Markopoulos, Read, et al., 2008). The computer products used are changed to suit the research requirements. Changes of the venue (room) for the evaluation session have to accommodate the research and nursery requirements. The start and end times in a study should be flexible according to nursery activities. Children could be allowed to share a computer if they wanted to. Existing procedures could be changed or new procedures could be introduced to suit the young children's reactions and behaviour.

The study plan should be flexible according to and depending on the progress of the research. It is suggested that no rigid plan should be made due to the children's unpredictable behaviour. However, it is advisable to draw up a systematic study plan with nursery staff in advance.

The researcher must be flexible in adopting a study plan according to the children's and nursery's requirements. Besides, the researcher also must have correct attitudes towards very young children, as will be explained in the next section.

6.6.2 Correct Attitudes

The researcher should have correct attitudes towards very young children when doing research with them, such as being independent and spontaneous, creative and observant, patient and firm, persuasive, building a rapport, and so on.

The researcher must be independent and able to solve spontaneous (impromptu) problems, creative and observant of children's preferences. In this research, to end the study with participants, the researcher changed her style, from shaking their hand (and saying thank you) to giving a high-five. Previously, the researcher said thank you and shook the child's hand, which was boring and very formal. In Section 4.2.4.1.1, the researcher started using a high-five to thank the children. The action was simple but had a big impact on some of the children, who seemed to like and enjoy it. It is important to create a fun evaluation session with very young children, as suggested by Markopoulos et al. (2008), "make it fun!"

Besides, it was very important to be patient and firm when working with very young children in the nursery. Sometimes children are moody, especially when their requests are rejected. For instance, one boy who was not satisfied pushed away the evaluation tools that were shown to him. He was not pleased when the researcher stopped him from playing on the computer when

his turn finished. The researcher has to be firm with children so that they feel they are being treated fairly.

Dealing with very young children requires the researcher to have persuasive skill. Some children could not follow the rules and procedures. If children try to stay at the computer for a longer time than allowed, the researcher should persuade them politely and firmly to stop interacting with the computer. The researcher told the children that their friends also wanted to play, every child has to be patient waiting for their turn, and to come and play on the computer on other days (if time had almost run out). The researcher also helped the children if they were stuck or lost while playing on the computer.

The researcher must build a good relationship with both children and staff. The researcher realised that a good relationship with the children is very important to get them to participate in the studies. As the studies were conducted in a natural nursery setting and on a voluntary basis, no children were forced to take part or to complete the studies. They had full freedom to take part in only half or to stop at any time/stage during the studies. The researcher found that, if the children wanted to become the researcher's friend, t was easier to get them to participate in the studies. The researcher devoted significant time to become part of the nursery, to build trust, confidence, and friendship with both the children and the staff.

6.7 Summary

The child development issues discussed in this chapter are related to cultural issues and the children's ages. The discussion touched on differences between the UK and Malaysia education systems and classroom settings, then covered the different ages of the children in the UK and Malaysia involved in this research.

Working with young children of different ages, nursery children (aged 3 to 5) and primary school children (aged 5 to 6) indicated that there were differences. Nursery children were more challenging and difficult to work with because they had a short attention span, were very energetic, had limited language and communication skills, and physical and mental limitations, while the primary school children were more confident and skilful in some aspects.

The challenges of working with very young children were discussed in six aspects; stakeholder participation, children's participation, nursery activities, bureaucracy and procedural matters, ill health, and weather. Stakeholders were classified into adult participation and children's participation in the research. However, the nursery staff's roles were not defined earlier and thus

they could not contribute to the research directly and clearly, although they were an important source in the nursery that could help speed up the research.

Methodological problems faced in this work were: assigning adult roles, the platform used (CBeebies website interface and content), and the venue, duration, and procedures of the study.

Several strategies were applied by the researcher to work with the nursery children in the UK. The strategies applied were: singing songs, playing together, reading story books, dressing casually, and joining in indoor and outdoor activities.

Besides these strategies, some few suggestions for conducting user studies with very young children that the researcher anticipates could help other researchers are discussed. The study plan must be flexible and allow changes in terms of the number of participants, the computer platform used, the duration, and procedures. Researchers need to have correct attitudes, being independent, observant, patient, firm, and persuasive. Besides, they need certain interpersonal or soft skills like communication, and creative problem-solving because working with very young children is challenging and unstructured.

The next chapter gives an overview of the research, how best to use the Feelings Toolkit, the strengths of the Feelings Toolkit, research contributions, limitations of the research and recommendations for future enhancement, and future enhancement of the Feelings Toolkit.

CHAPTER 7

CONCLUSION

7.1 Introduction

This chapter gives an overview of researching with young children to develop a new evaluation tool for very young children in the Child–Computer Interaction (CCI) research area. This is followed by an explanation of how best to use the Feelings Toolkit, the strengths of the Feelings Toolkit, research contributions, and limitations of the research and also recommendations for future enhancement. Finally, future enhancement of the Feelings Toolkit is proposed.

7.2 Overview

This research aimed to develop a new evaluation tool for young children. The aim was defined in three research questions (RQs). These were answered in this research, in particular chapters of the thesis as summarised in Table 7.1.

Table 7.1: Research questions answered in particular chapters in thesis

Research Questions (RQ)	Chapters
RQ1: What is a suitable evaluation tool to be used to evaluate feelings after very young children interact with computer products?	Development of Feelings Toolkit (Chapter 4)
RQ2: How can we evaluate the efficacy of the new evaluation tool?	Evaluating the Efficacy of the Feelings Toolkit (Chapter 5)
RQ3: What are the experiences of working with young children?	Experiences of Working with Young Children (Chapter 6)

Two main objectives (obj) were achieved in this research:

Obj1: To develop a new evaluation tool that can be used with and by very young children by using an iterative design approach and children's participation.

Obj2: To evaluate the efficacy of the new evaluation tool when used by very young children in kindergarten and children at home.

The first objective was indirectly achieved by reviewing related literature and conducting a preliminary study to choose the place and age of children to be researched in the initial phase.

The preliminary study was conducted at a nursery and at a primary school in Glasgow, UK. The first objective was directly achieved by developing a new evaluation tool for use with and by very young children, the Feelings Toolkit in the development phase. The tool development used an iterative design approach and children's participation. The second objective was achieved by evaluating the efficacy of the Feelings Toolkit with very young children at kindergarten and at home in Malaysia in the evaluation phase.

Developing the Feelings Toolkit applied two approaches, iterative design and children's participation, which took nearly two years to complete. Nursery children aged 3 to 5 in Glasgow, UK voluntarily participated in the tool development. In the development process, the Feelings Toolkit was iteratively tested by the nursery children. Nursery staff also contributed to the development of the Feelings Toolkit by giving feedback and suggestions. A series of exploratory sessions was conducted to learn about children's reactions to using the Feelings Toolkit.

Session 1 was conducted with the aim of observing how nursery children use the Feelings Toolkit after using a computer product. Session 2 was conducted with the aim of observing how nursery children use the Feelings Toolkit versions (*Wafiy* and *Alisya*) compared to the Smiley-adapted-to-Feelings Toolkit with children in the home environment with testing conducted by parents. The findings of sessions 1 and 2 showed that the Feelings Toolkit can be used with computer products and non-computer products. The findings of session 3 showed that very young children can use and respond to the Feelings Toolkit better than to the Smiley-adapted-to-Feelings Toolkit, which seemed not to be straightforward for one child.

Besides, one parent reported a failure to use the tool with her child. Another parent commented that one photograph *(love)* in the Feelings Toolkit versions was not clear. A further study was conducted to validate the Feelings Toolkit which was done with older children aged 6. The validation study was conducted in Malaysia to gain different experiences of evaluating the tool cross-culturally.

Evaluating the efficacy of the Feelings Toolkit was done by conducting a user study involving very young children aged 4 to 5 years old in Malaysia in two environments: in a kindergarten and at home. The findings show that the Feelings Toolkit is an efficacious tool for very young children to evaluate feelings after interacting with less-fun and fun edutainment courseware.

Experiences of working with young children were gained throughout the PhD research. The challenges were identified, the methodological problems were highlighted, strategies for

working with very young children were listed, and also suggestions for conducting user studies with very young children were compiled for future researchers.

How best to use the Feelings Toolkit is explained in the next section.

7.3 How Best to Use the Feelings Toolkit

The Feelings Toolkit can be used by a variety of people who are interested in obtaining more information about children's feelings. It can be used by parents at home. Designers and developers of children's products can use it in the office or school. Technology manufacturers can use it in the factory. Child psychologists can use the tool in the clinic or school. Children's trainers or facilitators can use it in the camp or school.

Besides, the Feelings Toolkit can be used in education. It can be used by a teacher with a group of children in a classroom setting during teaching and learning activities. The use of the Feelings Toolkit in a classroom with many children is slightly different from the original way of using it because the tool was designed for use with one child at a time. The teacher has to print the tool in large size (A4) for each photograph and laminate it. Then, the teacher shows each of the photographs from the front of the classroom after the learning and teaching activities. Besides education, another potential area is in psychology. It can be used by researchers who plan to conduct studies with very young children in their natural settings i.e. at home and in the nursery.

The Feelings Toolkit can be used in an interview and observation. It is recommended to use the Tool as an addition to the interview and observation rather than a replacement. Only five steps are required to use the Tool in the interview and observation. First, the facilitator (adult) shows the Feelings Toolkit to a child and asks the child to choose one version (the *Wafiy* Feelings Toolkit or the *Alisya* Feelings Toolkit). Second, the facilitator reads an introductory statement and points to related photographs. Third, the facilitator asks the child questions. Fourth, the facilitator writes all the responses and observation data in the empty boxes under the related photographs. Finally, the facilitator thanks the child for participating in the study.

Figure 7.1 and Figure 7.2 show the Feelings Toolkit versions respectively: the *Wafiy* Feelings Toolkit and the *Alisya* Feelings Toolkit.

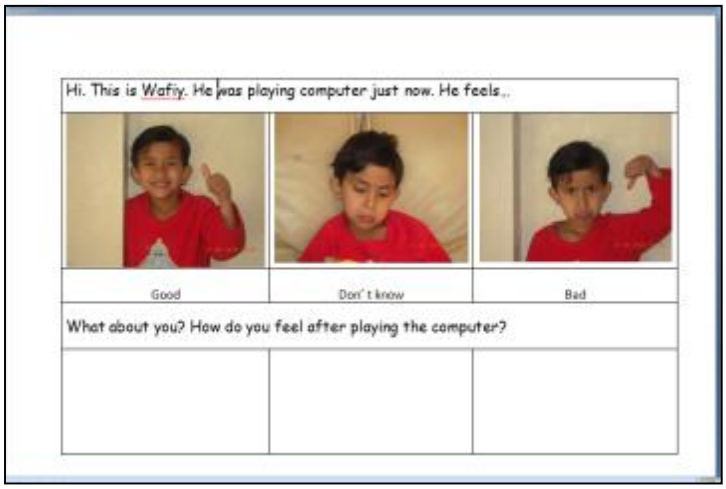


Figure 7.1: The *Wafiy* Feelings Toolkit

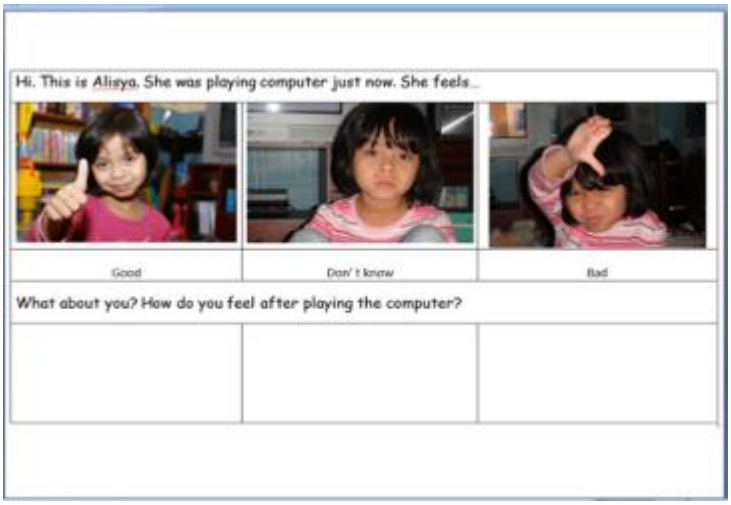


Figure 7.2: The *Alisya* Feelings Toolkit

Below are the step-by-step detailed instructions on how to use the Feelings Toolkit by the CCI community:

Step 1: The facilitator shows the tool and asks the child to choose one version (boy or girl) that the child likes most, then reads the introductory statement: *"Hi. This is Wafiy/Alisya (either one). He/she was playing on the computer just now. He/she feels.."*

Step 2: Then the facilitator points to the *good* photograph and says "*good*", followed by the neutral photograph and says "*don't know*" and finally points to the *bad* photograph and says "*bad"*.

Step 3: The facilitator asks the child: *"What about you? How do you feel after interacting with the computer product?"*

Step 4: The facilitator writes down the answer/responses and observation data in the empty boxes under the related photographs.

Step 5: The facilitator thanks the child for participating in the study and gives a high-five.

7.4 Strengths of the Feelings Toolkit

There are various strengths of using the Feelings Toolkit. For very young children, the Feelings Toolkit provides an easy-to-use tool for elicitation of the feeling after interacting with the computer. It helps them to express their feelings to adults in a simple way. They just point to the related photograph that indicates their feeling. The tool is easy-to-use and understand by very young children. The tool is suggested to be printed in colour to maintain quality and make it fun as children generally love something colourful.

The Feelings Toolkit is an efficacious tool when used with computer products and with non-computer products such as storybooks, toys, colouring sheets, and puzzles. It was proven that the Feelings Toolkit is efficacious compared to another tool, the Smiley-adapted-to-Feelings Toolkit which uses smiley emoticons.

The Feelings Toolkit is an efficacious tool when used with edutainment courseware by Malaysian youngsters. They can differentiate between good design and bad design and their experience of having a less-fun courseware and a fun courseware. Although this data was collected in Malaysia, the tool can be used in other countries.

In terms of generalizability, the Feelings Toolkit can be used with very young children cross-culturally, in both developed (e.g. the UK) and developing countries (e.g. Malaysia). Further studies could be done to enrich these findings around the world.

The research contributions are presented in the next section.

7.5 Research Contributions

This research contributes to the body of knowledge and to the CCI community:

Contribution to the body of knowledge

The Feelings Toolkit is a validated tool to evaluate feelings after very young children interact with computer products. It adapts previous studies using several visual representation (such as smiley faces and real photographs), Likert Scales, and Semantic Differential scales (see Section 2.5). Six stages were involved in the development of the Feelings Toolkit; designing and testing four initial tools in four stages (Stage 1 to Stage 4), conducting exploratory sessions to learn

about children's reactions to using the Feelings Toolkit in Stage 5, and finally validating the Feelings Toolkit in Stage 6.

The methodology applied in this research consists of three phases: initial phase, development phase, and evaluation phase. Each phase involves different activities. First, in the initial phase, the researcher started reviewing related literature and conducting a preliminary study to choose a suitable place to conduct the research and a suitable age group of children to research with. Second, in the development phase, the researcher developed a new evaluation tool to evaluate feelings after very young children interact with computer products. Finally, in the evaluation phase, the researcher conducted a user study to evaluate the efficacy of the new evaluation tool with and by very young children.

Contribution to the CCI community

A new evaluation tool was developed to help the Child–Computer Interaction (CCI) community to conduct evaluation studies with very young children. It is named the Feelings Toolkit and can be used to elicit feelings after very young children interact with computer products. The Feelings Toolkit has two versions; a boy version (*Wafiy* Feelings Toolkit) and a girl version (*Alisya* Feelings Toolkit) and uses photographic representation and bipolar adjectives. The Feelings Toolkit has been found to be efficacious when used with computer and non-computer products, for instance when the tool was used with less-fun and fun edutainment courseware. The Feelings Toolkit can be used by a variety of people such as parents, teachers, and children's technology developers and designers to conduct evaluation with very young children. The tool can be used in interviews and observation.

General suggestions on how to conduct a user study with very young children are derived from this research. The suggestions are based on the researcher's experiences gained throughout this research, mainly conducting studies in nursery/kindergarten and conducting studies in home environments (in the UK and Malaysia). Generally, research with young children needs flexibility, correct attitudes, and also soft skills e.g. creativity in problem-solving and patience, because it can be very challenging and unstructured.

The limitations of the research and recommendations for future enhancement are discussed in the next section.

7.6 Limitations of the Research and Recommendations for Future Enhancement

The limitations of the research and recommendations for future enhancement are discussed in four sub-sections; prototype development, school involvement, computer products and non-computer products, and data collection and data presentation.

7.6.1 Prototype Development

In this research, four initial prototypes, the Smiley Feelings Toolkit, Pictorial Feelings Toolkit, *Wafiy* Feelings Toolkit, and *Alisya* Feelings Toolkit, were designed and tested in the UK. The prototypes used several representations as described in Section 2.5.3, Section 4.2.1, Section 4.2.2, Section 4.2.3, and Section 4.2.4. The final prototype used photographic representation and bipolar adjectives. The photographs were modelled by two nursery-aged children (a boy and a girl of *Malay* ethnicity).

Then the Feelings Toolkit was validated in Malaysia, for one culture only. For this PhD work, the Feelings Toolkit was validated with older children aged 6 in a kindergarten and at home. Additional studies are required for further validating the Feelings Toolkit across different ethnicities and countries.

The Feelings Toolkit is a simple paper prototype, a format developed because of its easiness, cost and time factors, being simple, fast and cheap. The advantages of a paper prototype are (McCracken and Wolfe, 2004, p.128):

- It is easy to build.
- It is not necessary to wait for developers to create a (computer-based) prototype.
- It is fast to change. Erasing one link name and writing in another is quicker than rewriting the website code.
- It maximizes the number of times the design is refined before anything is committed to implementation.
- The lack of polish does not affect user opinion of the prototype.

Despite the advantages of using a paper prototype, the researcher felt it was not easy to use the paper Feelings Toolkit in particular situations, such as where many children are participating in a study and recording of data is done manually and individually by the researcher. Too much

observation data (qualitative) was collected during the study. Normally the data was written in a notebook describing the responses of each of the participants while playing with the computer product and then interacting with the Feelings Toolkit. Then reports were written immediately after conducting the study. Using the paper Feelings Toolkit in certain situations where there are many participants and one researcher is complicated and time-consuming.

Further investigation is needed to identify a new platform for the Feelings Toolkit that could make collecting data with very young children easy, efficient, and effective.

7.6.2 School Involvement

In the UK, only one nursery school and one primary school were involved in this research (see Section 3.2.3.1 and Section 3.2.3.2). The primary school was involved in an initial phase only when the preliminary study was conducted in both environments to choose a suitable place to conduct this research and an appropriate age group to work with. The nursery school was chosen as the place to work with the pupils to explore what kind of evaluation tool is easy and useful to them in evaluating computer products.

Only one kindergarten was involved in this research in Malaysia. The school was chosen based on the conditions established (see Section 4.2.6.1.1). Older children aged 6 in the kindergarten validated the Feelings Toolkit. Very young children aged 4 to 5 in the kindergarten evaluated the efficacy of the Feelings Toolkit using edutainment courseware (see Section 5.2.2). In the future, more schools could be involved to obtain more data.

7.6.3 Computer Products and Non-Computer Products Used

The main computer product used in this research was the CBeebies website, which was chosen as the main platform for children to interact with before they were asked to answer questions. The CBeebies website was chosen because it is based on a popular children's TV channel in the UK (see Section 3.2.3.3). Moreover, it is free and accessible to all nursery children and children at home as well. Other software, the Maths Circus Act 1, which was pre-installed on the nursery computer, was used in two studies, testing the Smiley Feelings Toolkit and Pictorial Feelings Toolkit (see Section 4.2.1.1 and Section 4.2.2.1). However, the use of the maths software was discontinued as very few nursery children liked and engaged in playing with it.

The non-computer products used in this research were limited to four only: a 3D book, magnetic train, colouring sheets, and maths puzzles (see Section 4.2.5.1).

Two edutainment coursewares were used in conducting the user study in Malaysia, Courseware1 (C1) and Courseware2 (C2) (see Section 5.2.1). Both were new and unfamiliar to participants to avoid any bias. The researcher considered Courseware1 to be less-fun and Courseware2 as fun.

It is recommended that more products, both computer products and non-computer products, are used to evaluate the Feelings Toolkit with very young children across the globe.

7.6.4 Data Collection and Data Presentation

Many qualitative data were collected in this research. A series of studies were conducted in the development phase and evaluation phase. It is very important to plan the research well, particularly on collecting data, because working with very young children in a nursery can be a very demanding and tiring job. When the data collection is done by one individual manually as mentioned in Section 7.2.1, there is a tendency to miss important data, particularly observation data. Therefore, it is recommended to involve nursery staff as facilitators, leaving the researcher to focus on being an observer and note-taker. But staff involvement must be applied earlier. If the staff's involvement is not approved by the nursery or Local Education Authority, one recommendation is to involve a friend of the researcher, making sure that the friend is granted a Disclosure Certificate.

It is recommended to write the children's answers and observation data using symbols, abbreviations, short forms, or any style that can make the writing process fast and accurate. Moreover, the data should be written in the same logbook, making sure the logbook is handy to carry and easy to use. A big A4 size logbook is not suitable because it looks unnatural and makes a note-taker look very formal to the children.

The data presented in this thesis used qualitative style because the nature of the research was exploratory. Less data were presented quantitatively except for a very few graphs to show a comparison of the two coursewares used in the user study (Figure 5.6 and Figure 5.7 in Section 5.2.4.1). For future research, quantitative data could also be gathered and statistical tools could be used for analysing the data.

Future enhancement to the Feelings Toolkit is explained in the next section.

7.7 Future Enhancement to the Feelings Toolkit

For future enhancement, the paper prototype could be transformed into a mobile platform since nowadays people are very engaged with mobile computing. Small gadgets like a tablet, mobile phone, or smart phone are platforms that can be used to develop a mobile Feelings Toolkit. The mobile Feelings Toolkit could be used with touch screen technology like an iPad^{tm} or iPhone^{tm}. Evidence gathered from the research showed that the majority of children used the pointing finger method to answer questions using the paper prototype Feelings Toolkit, which was as expected.

The new mobile Feelings Toolkit should be able to capture children's answers and responses automatically and efficiently compared to the manual style, whether they point to the relevant photographs, verbalise word(s), and/or use mixed methods. Besides, the mobile Feelings Toolkit should be able to capture images of children's facial expressions and body gestures automatically, such as the children nodding and/or shaking their heads, smiling, imitating photographs, and so on. This would enable one researcher/adult to be enough for facilitating an evaluation session, to overcome the problems in Section 6.4.1.

However, to digitize the Feelings Toolkit from a paper prototype to a mobile delivery platform, issues like choosing the right size of gadget and cost have to be considered. F

For now, the Feelings Toolkit contributes to serve the purposes of this PhD. But to expand the potential of the tool, the Feelings Toolkit may require to be validated using a statistical tool, e.g. the Rasch Measurement Model. The Feelings Toolkit evaluation tool is a novel contribution in the research area.

7.8 Summary

This research achieved the main objectives: (1) to develop a new evaluation tool that can be used with and by very young children by using an iterative design approach and children's participation, and (2) to evaluate the efficacy of the new evaluation tool by very young children in kindergarten and children at home. Three research questions which were derived from the objectives were answered in this research by implementing several activities in three different phases.

In the initial phase, related literature was reviewed to better understand the nature of this research. Then, a preliminary study was conducted in a nursery and a primary school in the UK.

From the study, the researcher learned that working with nursery children is very challenging but worthwhile. In the development phase, a new evaluation tool, the Feelings Toolkit, was developed. The Feelings Toolkit is a simple, easy, and intuitive evaluation tool which is suitable to be used with and by very young children. It has two versions, a boy version (*Wafiy* Feelings Toolkit*)* and a girl version (*Alisya* Feelings Toolkit). In the evaluation phase, the Feelings Toolkit was proven to be an efficacious tool for very young children.

How best to use the Feelings Toolkit is suggested. The strengths of the Feelings Toolkit and research contributions are highlighted. The limitations of the research and recommendations for future enhancement are presented. Future enhancement to the Feelings Toolkit is also suggested for future research in the Child–Computer Interaction (CCI) community.

In the CCI, this is the first research on developing a new evaluation tool for very young children aged 3 to 5 years old. The evaluation tool is a novel contribution in the research area.

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APPENDICES

Appendix A - Application Letter to Nursery

7th May 2009

Head Teacher
Isabel Gray
Govanhill Nursery School
335 Allison Street
G42 8HH
Glasgow

Dear Madam

Application to Conduct Evaluation on Children's Interaction with CBeebies Website at Govanhill Nursery School

I would like to ask permission to conduct an evaluation on children's interaction with the CBeebies website at your nursery. This would be a small study in which children would be asked to interact with the CBeebies website and I would ask them what they like about the site. This study will help inform my PhD research which is on the topic of children's evaluation of information systems.

I have attached details of the study plan for your consideration.

I am looking forward to hearing from you soon.

You cooperation is very much appreciated and many thanks.

Yours sincerely

Yusrita Mohd Yusoff
PhD Student
University of Strathclyde, Glasgow
Email: yusrita.yusoff@cis.strath.ac.uk
Tel: 0141 548 4311

Appendix B - Supporting Letter from Supervisor

Isabel Gray
5 June 2009
Govanhill Nursery School
335 Allison Street
G42 8HH
Glasgow

Dear Ms Grey

Enclosed is a letter from Yusrita Mohd Yusoff requesting help with a small user study on children's interaction with the CBeebies website. Mrs Yusoff is a first year PhD student under my supervision. She is engaged on a research programme to understand how children evaluate information systems, such as the CBeebies site, in order that computer designers can develop more appropriate systems for use by children. Very few system designers ask young children for their opinions on systems and Mrs Yusoff's research will be very important in helping system designers incorporate the opinions of young children in their systems and websites.

Mrs Yusoff is requesting access to children in your school to conduct a small initial study to gain experience of working with young children in system evaluation. Such access would be of great help to her research. We realise, of course, that if such access were permitted you, and the children's parents would need to be assured of the integrity of our research. We have enclosed some details of the study planned including the arrangements regarding ethical procedures. We would be more than happy to comply with any additional checks that you think appropriate.

Mrs Yusoff is a very friendly and engaging young researcher who can interact easily and has high integrity in her research and persoanl interactions. As a mother of three children she is experienced in intaercating with young children and very sensistive to their needs.

I hope we will be able to work with you on this small study an am very happy to discuss any questions you may have about the study.

I have attached details of the study plan for your consideration.

I am looking forward to hear from you soon.

You cooperation is very much appreciated and many thanks.

Yours sincerely

Dr Ian Ruthven
Deputy Head of Department
University of Strathclyde, Glasgow

Appendix C - Study Plan and Consent Form of Preliminary Study

Evaluation of Children's Interaction with CBeebies Website

I am Yusrita Mohd Yusoff, a PhD student in the Department of Computer and Information Sciences at the University of Strathclyde. My research is on evaluating fun on children's computer products. As part of this research, I would like to understand how children decide whether or not a computer application is 'fun'. This research would allow system designers to design better computer products for children's use and education.

I would like to conduct a series of small studies on children's interaction with computer products such as edutainment websites to test different ideas in assessing the fun of computer products among young children at public nursery school. The study will be a 'light' one in which children will be asked to interact with identified websites for a few minutes and answer some questions about whether they enjoy using the computer products.

The evaluation will be conducted at the following details:
Place: *Nursery X*, Glasgow
Date: 29 May 2009 (Friday)
Time: 9.30 a.m. – 10.30 a.m. (approximately)
Participants: *Nursery X* Children
Duration: 15 minutes x 5 children = 75 minutes
Each session would cover 1 group of 5 (max) children for a max of 75 minutes.

Materials

Materials that will be used in the evaluation session can be categorised into two categories: supplied by the nursery and supplied by the researcher. Materials that the nursery will provide are one computer with access to the CBeebies website, particularly the Fun and Games link. Materials that the researcher will bring are a notebook, pen, pencil, watch, and evaluation sheets. Procedures involved in the evaluation session are explained in detail in the next section.

Procedures

It will be a one-to-one evaluation and interview session between the researcher and the children. The procedures will be:

1. Greet the children.
2. Introduce researcher.
3. Each child who volunteers will be asked to sit down in front of the computer and asked to play with/explore Fun and Games on the CBeebies website for 5 minutes.
4. The children will be interviewed about 5 minutes after the exploration. The interview will be completely informal.
5. Each child will be asked to draw the character that he/she likes most in 5 minutes.
6. Each child will be thanked for their participation in the evaluation session.

Questions

There are a few open and closed questions to be asked depending on the children's feedback and responses, such as:

1: Have you seen this program before?
2: Have you used this program before?
3: Do you like to play games from this website?
4: Which game do you like to play?
5: Why do you like to play this game?
6: Do you like the colours used?
7: Do you like to hear songs from this game?
8: How do you feel after playing this game?
9: Do you want to recommend this game to your friend? Why?
10: Can you draw the character that you like most from the site?

Ethics of Study

In order to protect human rights and privacy, these ethical guidelines will be followed during the evaluation session:

1. This study is to obtain children's opinion on interacting with the identified website and not to test the children themselves.
2. All information will be treated confidentially and their anonymity will be respected at all times.
3. The data may be published in a thesis, research papers or presentations.
4. Any notes taken during the study will be destroyed after five years.
5. I give permission for the researcher to maintain records of the study and to run a follow-up study in the future.
6. All children who participate can withdraw from the study at any time.

Consent Form

I _____ (name) give permission for my children _____

(name) to take part in this evaluation study of an edutainment website at the Govanhill Nursery.

Signature: _____ Date: _____

Appendix D - Good Conduct Certificate

MINISTRY OF FOREIGN AFFAIRS
Wisma Putra, No. 1, Jalan Wisma Putra,
Presint 2, 62602 Putrajaya,
Malaysia.

Tel : 603 - 8887 4000
Fax : 603 - 8889 2927

(050)380/2-2

8 JULY 2008

TO WHOM IT MAY CONCERN

THIS IS TO CERTIFY THAT BASED ON THE STATUTORY DECLARATION DATED 2 JULY 2008 AND SUBMITTED TO THE MINISTRY OF FOREIGN AFFAIRS MALAYSIA BY MS. YUSRITA BINTI MOHD YUSOFF PASSPORT NO A10351541, THE GOVERNMENT OF MALAYSIA FINDS HER TO BE A PERSON OF GOOD CONDUCT.

MINISTRY OF FOREIGN AFFAIRS
COMMAND

for SECRETARY GENERAL
MINISTRY OF FOREIGN AFFAIRS
MALAYSIA

Appendix E - Answer Sheet for User Study in Evaluation Phase

Participant (Age)	Gender Boy (B) / Girl (G)	Feelings Toolkit Versions		Feelings			
		Wafiy	*Alisya*	Good	Neutral	Bad	Remarks (Observation)

Appendix F - The *Wafiy* Feelings Toolkit (4 sheets)

Hi. This is Wafiy. He was playing computer just now. He feels…		
		
Happy	Don’ t know	Sad
What about you? How do you feel after playing the computer?		

Hi. This is Wafiy. He was playing computer just now. He feels…

		
Good	Don’ t know	Bad

What about you? How do you feel after playing the computer?

Hi. This is Wafiy. He was playing computer just now. He feels…

		
Love	Don’ t know	Hate

What about you? How do you feel after playing the computer?

Hi. This is Wafiy. He was playing computer just now. He feels…

		
Excited	Don’ t know	Bored

What about you? How do you feel after playing the computer?

Appendix G - The *Alisya* Feelings Toolkit (4 sheets)

Hi. This is Alisya. She was playing computer just now. She feels…		
		
Happy	Don’ t know	Sad
What about you? How do you feel after playing the computer?		

Hi. This is Alisya. She was playing computer just now. She feels…

		
Good	Don’ t know	Bad

What about you? How do you feel after playing the computer?

Hi. This is Alisya. She was playing computer just now. She feels…

		
Love	Don’ t know	Hate

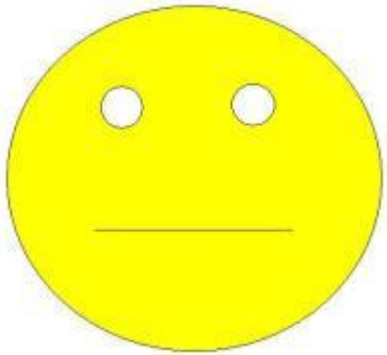
What about you? How do you feel after playing the computer?

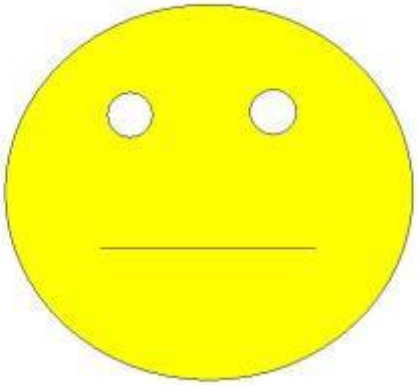
Hi. This is Alisya. She was playing computer just now. She feels…

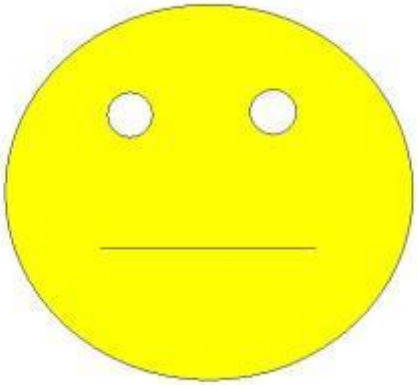
		
Excited	Don’ t know	Bored

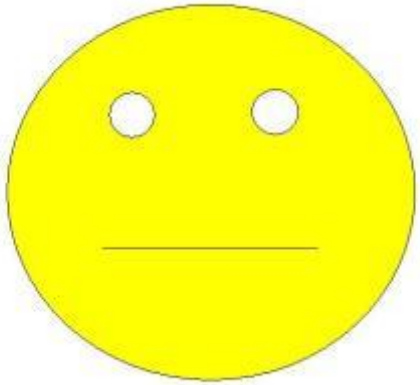
What about you? How do you feel after playing the computer?

Appendix H - The Smiley-Adapted-to-Feelings Toolkit

Hi. Smiley was playing computer just now. Smiley feels…		
		
Happy	Don’ t know	Sad
What about you? How do you feel after playing the computer?		

Hi. Smiley was playing computer just now. Smiley feels…		
		
Good	Don’ t know	Bad
What about you? How do you feel after playing the computer?		

Hi. Smiley was playing computer just now. Smiley feels……		
		
Love	Don’ t know	Hate
What about you? How do you feel after playing the computer?		

Hi. Smiley was playing computer just now. Smiley feels……		
		
Excited	Don’ t know	Bored
What about you? How do you feel after playing the computer?		

Appendix I - Answer Sheet for Validation Study

Answer Sheet for Validation Study to Identify Photographs																				
Participant	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
Gender (Boy/Girl)																				
Feelings Toolkit Versions *(Wafiy/Alisya)*																				
Round 1																				
happy																				
sad																				
good																				
bad																				
love																				
hate																				
excited																				
bored																				
Round 2																				
happy																				
good																				
love																				
excited																				
sad																				
bad																				
hate																				
bored																				

Appendix J - Instruction Sheet for Parents in Validation Study

Dear Parents

These are instructions to be followed. I guess you will only need 5 minutes to conduct this study with your child at home. Thank you for your time.☺

1. Ask your child to choose which version he/she likes most; a boy or a girl version.
2. Organise the instrument as in (i).
3. Ask the child to point to a related photograph according to feelings in XYZ.
   a. E.g. *"Please show mummy/daddy which is a happy picture."*
4. Write the answers in the provided sheet.
   a. If answer is correct then tick.
   b. If answer is wrong then write what the child verbalised.
5. Organise the instrument as in (ii).
6. Repeat steps 3 and 4.
7. Don't forget to photograph the session.

(i) Round 1

1	2
3	4

(ii) Round 2

4	3
2	1

XYZ

1.

Happy		*Sad*

2.

Good		*Bad*

3.

Love		*Hate*

4.

Excited		*Bored*

~ Finish ~

Appendix K - Data of Validation Study (Kindergarten)

The following table shows the kindergarten children's scores for identifying correct pictures (positive and negative) in *Wafiy* Feelings Toolkit and *Alisya* Feelings Toolkit .

Correct score of both Feelings Toolkit = Correct score of Wafiy Feelings Toolkit + Correct score of Alisya Feelings Toolkit

Legend: H=Happy, S=Sad, G=Good, B=Bad, L=Love, Ht=Hate, E=Excited, Br=Bored, DK=Don't Know

Participant	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	Correct score of both Feelings Toolkit	Correct score of *Wafiy* Feelings Toolkit	Correct score of *Alisya* Feelings Toolkit
Gender	Girl	Girl	Boy	Boy	Boy	Boy	Girl	Girl	Boy	Boy	Boy	Boy	Boy	Girl	Girl	Girl	Girl	Boy	Girl	Boy			
Feelings Toolkit Versions	A	A	W	W	W	W	A	A	W	W	W	W	W	A	A	A	A	W	A	W			
Round 1																							
Happy (H)	E	E	G	/	L	/	E	E	/	G	G	E	E	E	E	E	G	L	E	E	3	3	0
Sad (S)	/	/	B	/	H	/	DK	DK	DK	DK	H	/	DK	/	DK	DK	/	/	/	H	9	4	5
Good (G)	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	20	11	9
Bad (B)	/	/	/	/	/	/	/	/	/	/	/	/	/	DK	/	/	/	/	/	/	19	11	8
Love (L)	H	E	E	H	E	/	H	H	E	E	/	H	/	H	E	Ht	E	/	E	G	4	4	0
Hate (Ht)	S	DK	B	B	DK	H	Br	Br	DK	S	DK	DK	DK	DK	DK	DK	Br	DK	DK	B	0	0	0
Excited (E)	/	/	H	H	G	L	/	/	L	/	H	L	/	/	/	/	/	H	/	/	12	3	9
Bored (Br)	DK	DK	B	S	S	DK	DK	S	DK	DK	DK	Ht	/	Ht	S	DK	/	DK	Ht	B	2	1	1
Round 2																							
Happy (H)	E	/	/	E	L	/	E	E	E	E	G	E	E	E	/	G	E	E	E	E	4	2	2
Good (G)	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	20	11	9
Love (L)	/	E	G	E	H	H	E	/	/	H	/	H	/	E	E	H	H	/	H	H	6	4	2
Excited (E)	H	H	H	/	L	L	/	/	/	L	/	L	Ht	H	/	/	/	G	/	L	9	3	6
Sad (S)	/	Ht	Ht	Ht	DK	/	DK	DK	/	DK	Ht	/	DK	DK	/	DK	Br	/	Br	Ht	6	4	2
Bad (B)	/	/	/	/	DK	/	/	/	/	/	/	/	/	DK	/	/	/	/	/	/	18	10	8
Hate (Ht)	/	DK	DK	B	B	B	DK	DK	DK	DK	DK	/	DK	DK	DK	S	B	DK	DK	DK	2	1	1
Bored (Br)	DK	DK	DK	DK	B	B	/	S	DK	S	DK	Ht	DK	/	/	DK	DK	DK	DK	DK	3	0	3

Appendix L - Data of Validation Study (Home)

The following table shows the home study children's score for identifying correct pictures (positive and negative) in *Wafiy* Feelings Toolkit and *Alisya* Feelings Toolkit
.

Correct score of both Feelings Toolkit = Correct score of Wafiy Feelings Toolkit + Correct score of Alisya Feelings Toolkit
Legend: H=Happy, S=Sad, G=Good, B=Bad, L=Love, Ht=Hate, E=Excited, Br=Bored, DK=Don't Know

Participant	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	Correct score of Both Feelings Toolkit	Correct score of Wafiy Feelings Toolkit	Correct score of Alisya Feelings Toolkit
Gender	Boy	Girl	Girl	Boy	Girl	Boy	Girl	Girl	Girl	Boy	Girl	Boy	Boy	Boy	Girl	Boy	Boy	Boy	Boy	Girl	Girl			
Feelings Toolkit Versions	W	A	A	W	A	W	A	A	A	W	A	W	W	W	A	W	W	W	W	W	A			
Round 1																								
Happy (H)	/	/	E	/	E	E	E	E	E	L	E	G	/	/	/	/	/	L	/	/	/	11	8	3
Sad (S)	Ht	/	/	/	DK	/	/	/	/	Ht	Br	/	/	/	Br	/	/	/	/	/	DK	15	10	5
Good (G)	/	/	/	/	E	/	/	/	/	/	/	/	/	/	/	/	/	H	/	/	/	19	11	8
Bad (B)	/	Br	/	/	S	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	19	12	7
Love (L)	E	E	/	E	E	E	/	H	H	E	H	L	/	/	E	/	E	G	/	/	/	8	5	3
Hate (Ht)	S	DK	Br	/	DK	DK	Br	DK	/	DK	S	DK	DK	DK	DK	Br	DK	DK	DK	S	S	2	1	1
Excited (E)	/	/	H	L	/	H	/	/	/	H	L	H	/	/	/	L	/	/	H	/	/	13	6	7
Bored (Br)	DK	DK	/	DK	/	/	Ht	DK	DK	S	DK	/	DK	/	DK	DK	/	DK	/	DK	/	8	5	3
Round 2																								
Happy (H)	/	/	E	/	E	E	L	E	E	/	E	/	/	/	/	/	/	G	/	L	/	12	9	3
Good (G)	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	H	/	/	/	20	11	9
Love (L)	E	E	H	E	H	H	E	H	H	E	DK	DK	/	/	G	/	/	/	H	/	/	7	6	1
Excited (E)	L	/	H	/	/	L	H	/	/	H	L	/	/	/	/	L	/	/	/	/	/	14	8	6
Sad (S)	Ht	/	/	Ht	/	/	/	/	/	Ht	/	DK	DK	DK	/	/	Ht	Ht	/	DK	/	12	3	9
Bad (B)	/	DK	/	/	DK	/	/	/	/	/	DK	/	/	/	/	/	/	S	/	/	Ht	16	11	5
Hate (Ht)	S	DK	DK	S	DK	/	DK	DK	DK	DK	Br	DK	DK	DK	Br	DK	DK	B	/	/	S	3	3	0
Bored (Br)	DK	/	/	DK	/	/	DK	DK	/	S	DK	/	DK	DK	DK	B	DK	DK	DK	DK	/	7	2	5

Appendix M - Data of User Study (Kindergarten)

For this study, C1 – Less-Fun courseware; C2 – Fun Courseware

	Participant Age	Gender	Feelings Toolkit Selections		Course-ware	Good	Don't Know	Bad	Remarks (Observation)
		Boy (B) / Girl (G)	*Wafiy*	*Alisya*					
1 - 2 Round (R1): Less-Fun Courseware Round (R2): Fun Courseware	P1 5YO	G	/		C1	/			R1- Points to good photo.
				/	C2	/			R2- Points to good photo and says “good”.
	P2 5YO	G		/	C1		/		R1- Points to good photo.
			/		C2	/			R2- Points to good photo.
	P3 5YO	G		/	C1	/			R1- Points to good photo and says “good. I play computer with my sister at home..”.
				/	C2	/			R2- Points to good photo and says “good”.
	P4 5YO	G		/	C1	/			R1-Points to good photo and says “I like the game..”.
				/	C2	/			R2- Points to good photo and says “because this game is good..”.
	P5 5YO	B	/		C1	/			R1- Points to good photo and says “good”.
				/	C2	/			R2- Points to good photo and says “good”.
	P6 4YO	G		/	C1	/			R1- Points to good photo.
				/	C2	/			R2- Points to good photo.
2 - 1 Round (R1): Fun Courseware Round (R2): Less-Fun	P7 5YO	G		/	C2	/			R1- Points to good photo.
				/	C1	/			R2- Points to good photo and says “good...I only read books at home. No games..”.

	Participant Age	Gender	Feelings Toolkit Selections		Course-ware	Good	Don't Know	Bad	Remarks (Observation)
		Boy (B) / Girl (G)	*Wafiy*	*Alisya*					
Courseware	P8 5YO	G		/	C2	/			R1- Points to good photo.
				/	C1		/		R2- “Don’t know”
	P9 5YO	G		/	C2	/			R1- Points to good photo and says “good”.
				/	C1	/			R2- Points to good photo and says “good”.
	P10 5YO	G		/	C2	/			R1- Nods head and says “I know...”.
				/	C1	/			R2- Points to good photo.
	P11 5YO	B	/		C2	/			R1- Points to good photo.
			/		C1	/			R2- Points to good photo.
	P12 4YO	B	/		C2	/			R1- “Good”
			/		C1	/			R2- “Good”

Appendix N - Data of User Study (Home)

For this study, C1 – Less-Fun courseware; C2 – Fun Courseware

	Participant Age	Gender	Feelings Toolkit Selections		Course-ware	Good	Don't Know	Bad	Remarks (Observation)
		Boy (B) / Girl (G)	*Wafiy*	*Alisya*					
1 - 2 Round (R1): Less-Fun Courseware Round (R2): Fun Courseware	P1 5YO	G		/	C1			/	R1- Shakes head and verbalises “bad”. After 2 minutes does not want to play it.
			/		C2	/			R2- Points to good photo and says “I like the bear, watch TV, and puzzle...”.
	P2 5YO	B		/	C1	/			R1- Points to good photo but says “bored” and wants to stop playing.
			/		C2	/			R2- Shows good sign and wants to repeat playing the game. Parent observes the child is really engaged with computer and shows happy face.
	P3 5YO	B	/		C1		/		R1- “Dont’ know” and shrugs shoulder.
			/		C2	/			R2- “Good”
	P4 5YO	G	/		C1	/			R1- Points to good photo.
			/		C2	/			R2- Points to good photo.
	P5 4YO	B	/		C1	/			R1- Shows good sign but shakes his head and says “bored because no colour...”
				/	C2	/			R2- Shows good sign and says “there is song, colour photos...”.
	P6 4YO	B	/		C1	/			R1- “Good” and shows good sign.
			/		C2	/			R2- “Good...very good” and shows good sign. Keeps playing and does not want to stop especially on matching pictures in C2.
	P7 4YO	G		/	C1		/		R1- “Not nice..” and points to neutral photo. The child does not want to play.
				/	C2	/			R2- “Good”. Parent observes the child happily playing and likes to watch cartoon in C2.
	P8 5YO	B		/	C1			/	R1- “Don’t like.. this is bad”.

	Participant Age	Gender	Feelings Toolkit Selections		Course-ware	Good	Don't Know	Bad	Remarks (Observation)
		Boy (B) / Girl (G)	*Wafiy*	*Alisya*					
				/	C2			/	R2- "I like this… and points to good photo.
	P9 5YO	B	/		C1		/		R1- "I feel good because there are pictures..."
			/		C2	/			R2- "I feel good because I can change clothes, match jigsaw, and lots of pictures. I feel good because it's like a story. Good because so many things there; writing, pictures, story..."
2 - 1 Round (R1): Fun Courseware Round (R2): Less-Fun Courseware	P10 3YO	B	/		C2	/			R1- "Good" and shows good sign.
				/	C1			/	R2- "Bad"
	P11 3YO	G		/	C2	/			R1- Says "Good". Repeats playing C2 many times compared to C1.
				/	C1	/			R2- Says "Good". Parent observes that child seems excited to play C1 but then looks confused and asks, "which story should I watch?" The child excitedly looks at *Alisya* Feelings Toolkit before starting to play C1.
	P12 4YO	G	/		C2	/			R1- "Good…there is cartoon. Nice cartoon, but I don't know to read..".
			/		C1			/	R2- "Bad...bad colours, no cartoon...no good... ."
	P13 5YO	G		/	C2	/			R1- Says "good", shows good sign and smiles, says the game is exciting, there is a cartoon.
				/	C1		/		R2- "Don't know. No colour, no sound, dull. I want to play outside.. ."
	P14 5YO	G		/	C2	/			R1- "Good..when I press (click), there is Tom & Jerry song.."
				/	C1			/	R2- "Bad because no story..."
	P15 4YO	B	/		C2	/			R1- "I feel good but I don't know how to tell. I feel excited. Very good.." .
			/		C1			/	R2- "Bad..no games, not colourful, so bored.."
	P16 5YO	G	/		C2	/			R1- "Good...I like it. I like numbers and puzzle.."
				/	C1	/			R2- "Feel excited...I like to play with numbers.."
	P17 5YO	B	/		C2	/			R1- Points to good photo. Asks parents to repeat C2 a few times.

	Participant Age	Gender	Feelings Toolkit Selections		Course-ware	Good	Don't Know	Bad	Remarks (Observation)
		Boy (B) / Girl (G)	*Wafiy*	*Alisya*					
			/		C1			/	R2- Points to bad photo and does not want to play any more.
	P18 4YO	G		/	C2	/			R1- Shows good sign.
			/		C1			/	R2- Writes '*bad*' in the *Wafiy* Feelings Toolkit but uses acronym B. Parent reported that the child wanted to write her name in the Feelings Toolkit.

Appendix O - Parent Consent Form

Dear Parent

I am Yusrita Mohd Yusoff, a PhD student in the Department of Computer and Information Sciences at the University of Strathclyde. My research is on evaluating feelings after children interact with computer products. This research would allow system designers to design better computer products for children's use and education.

I would like to conduct a series of small studies on children's interaction with computer products such as edutainment websites in evaluating their feelings at public nursery school. The study will be a 'light' study, in which children will be asked to interact with identified websites for a few minutes and answer some questions about how they feel after playing on the computer products.

The evaluation will be conducted at the following details:

Place: Govanhill Nursery School, Glasgow

Date: From February 2010 until February 2011

Time: 9.30 a.m. – 11.30 a.m. (approximately)

Participants: Govanhill Nursery Children, Glasgow

Duration: 10 minutes x 5 children = 50 minutes

Each session will cover 1 group of 5 (max) children for a max of 50 minutes.

Please refer to Details of the Study at the back.

Consent Form

1. This study is to obtain children's opinions on interacting with the identified website and not to test the children themselves.
2. All information will be treated confidentially and their anonymity will be respected at all times.
3. The data may be published in a thesis, research papers or presentations.
4. Any notes taken during the study will be destroyed after five years.
5. I give permission for the researcher to maintain records of the study and to run a follow-up study in the future.
6. All children who participate can withdraw from the study at any time.

I _____ (name) give permission for my children _____

(name) to take part in this evaluation study of an edutainment website at the Govanhill Nursery.

Signature: _____ Date: _____

Details of the Study

Procedures

It will be a one-to-one evaluation session between the researcher and children. The procedures will be:

1. Greet the children.
2. Introduce researcher.
3. Each child who volunteers will be asked to sit down in front of the computer and asked to play with/explore Fun and Games on the CBeebies website or any identified products for 5 minutes.
4. The children will be asked about their feeling after interacting with the products, using a newly developed evaluation tool. The interview will be completely informal.
5. Each child will be thanked for their participation in the study.

Appendix P - Children Consent Form

Children Consent Form

Would you like to take part in my study?

First, you play CBeebies for 5-10 minutes. Then, choose one version of the Feelings Toolkit.

Finally, answer my questions.

	Name	 Yes	 No
1.			
2.			
3.			
4.			
5.			

Signature:…….