

EDUCATIONAL PAINTER FOR PRESCHOOL CHILDREN

QUSAY ABBOODI ALI

UNIVERSITY UTARA MALAYSIA

2012

Educational Painter for Preschool Children

**A project submitted to Dean of Awang Had Salleh Graduate School in
Partial Fulfilment of the requirement for the degree
Master of Science of Information Technology
University Utara Malaysia**

By

QUSAY ABBOODI ALI

Copyright © Qusay, 2012. All rights reserved

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

اقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ ﴿١﴾ خَلَقَ الْإِنْسَانَ مِنْ عَلَقٍ

﴿٢﴾ اقْرَأْ وَرَبُّكَ الْأَكْرَمُ ﴿٣﴾ الَّذِي عَلَّمَ بِالْقَلَمِ ﴿٤﴾ عَلَّمَ

الْإِنْسَانَ مَا لَمْ يَعْلَمْ ﴿٥﴾

صِدْقَ اللَّهِ الْعَظِيمِ

سورة العلق

PERMISSION TO USE

In presenting this project in partial fulfillment of the requirements for a postgraduate degree from the University Utara Malaysia, I agree that the University Library may make it freely available for inspection. I further agree that permission for copying of this project in any manner in whole or in part, for scholarly purposes may be granted by my supervisor(s) or in their absence by the Dean of Postgraduate Studies and Research. It is understood that any copying or publication or use of this project or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to University Utara Malaysia for any scholarly use which may be made of any material from my project.

Requests for permission to copy or to make other use of materials in this project, in whole or in part, should be addressed to

Dean of Awang Had Salleh Graduate School

College of Arts and Sciences

University Utara Malaysia

06010 UUM Sintok

Kedah Darul Aman

Malaysia

Abstract

A lot of people are trying to educate their children via ICT from the early stages of their age. Thus, the learning by drawing using computers is important to promote children skills because drawing develops children imagination. There are a lot of educational programs about the education of children on the drawing, but these programs are designed at a high level in which it is difficult for children to use it. The proposed painter application is designed to teach children drawing, by providing relevant drawing tools. It is also equipped with alphabet learning and it is pronunciation, so that can learn letters while drawing.

ACKNOWLEDGMENTS

Praise and thank to Allah for his guidance and blessing for giving me the strength and perseverance to complete this project.

I wish to thank all my dearest family members, especially my Dad and Mum, and my Wife with all my Brothers and Sisters, all of them with me for being by my side since I left my home. For their continuous support, understanding and encouragement until this project has finally finish.

I would like to acknowledge the following person whose support has been very significant in ensuring the successful completion of this project. First and foremost, I am grateful to my supportive and helpful supervisor Dr. Yuhanis binti Yusof for her guidance and constant motivation and for assessing and guiding me in the completion of this research. With all truthfulness, without them, the project would not have been a complete one. I am truly grateful for her continual support and cooperation in assisting me in all the way that has enabled me to complete my project work.

I would like to thank for my friend Asam Hamed Abbas AL-Mohamed for help me in this project through to give me guidance on how to write a thesis.

Thanks are also extended to kindergarten (Pusat Perkembangan Kanat - Kanak Tunku Puteri Intan Safinaz University Utara Malaysia) and all the staff members for their help to evaluate and execute this study. Finally I am indeed very grateful to have all of you around me thus given me courage and energy to complete this project. Also thank to all my lecturers and friends who help me and give me emotional support during my study, Thanks to all and thank you UUM.

QUSAY ABBOODI ALI

TABLE OF CONTENTS

Permission To Use.....	I
Abstract.....	II
Acknowledgments.....	III
Table of Contents.....	IV
List of Figures.....	VIII
List of Tables.....	X

CHAPTER ONE: INTRODUCTION

1.1 Introduction.....	1
1.2 Problem Statement	4
1.3 Research Questions.....	5
1.4 Research Objectives.....	6
1.5 Research Scope.....	6
1.6 Research Significance.....	6
1.7 Report Structure	7

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction.....	8
2.2 Use of ICT in Education of Preschool Children	8
2.3. Language Learning via new Technologies	11
2.4. Learning via Drawing	13
2.5. Technology integration in education	16
2.6. Multimedia	17
2.7. Designing the interface.....	19
2.8. Summary.....	21

CHAPTER THREE: RESEARCH METHODOLOGY

Research Methodology.....	22
3. 1 Awareness of Problem.....	23
3.2 Suggestion.....	23
3.2.1. Application Requirements	24
Functional Requirements	24
Non Functional Requirements	26
3.2.2 Design of <i>EduPaint</i>	28
Use case Diagram.....	28

Use case specification for (<i>EduPaint</i>).....	30
Sequence Diagram for (<i>EduPaint</i>).....	42
Collaboration Diagram for (<i>EduPaint</i>).....	48
Class Diagram.....	52
3.3. Development	54
3.3.1 Java programming	54
3.4 Evaluation.....	55
3.5 Conclusion.....	55
3.6 Summary.....	56

CHAPTER FOUR: EDUCATIONAL PAINTER PROTOTYPE FOR PRESCHOOL CHILDREN

Educational Painter Prototype for Preschool Children	57
4.1. Buttons Requirements	57
4.2. Sound Requirements	58
4.3. Educational Requirements	58
4.3.1 Alphabet Letters	58
4.3.2 Repeat Pronunciation Letter	58
4.4. Overview of <i>Edupaint</i>	59
4.5 Summary.....	69

CHAPTER FIVE: EVALUATION & RESULTS

5.1 Evaluation	70
5.2. Demographics profile	71
5.2.1 Children Demographic.....	71
5.2.2 Teacher and Parent Demographic.....	75
5.3. Usability.....	78
5.3.1. Learnability.....	78
5.3.2. Usefulness	82
5.3.3. Ease of use.....	85
5.4 Summary	92

CHAPTER SIX: CONCLUSION

Conclusion	93
6.1. Problems and limitations.....	93
6.2. Recommendation for Future works	93
6.3. Conclusion.....	94
6.4 Summary	95
References.....	96

LIST OF FIGURES

Figure 2.1 ICT in Education	9
Figure 2.2 Learning via Drawing	15
Figure 3.1 General Methodology for Design Research (GMDR)	22
Figure 3.2 Model Application Painters for Children	24
Figure 3.3 Use Case Diagrams for (<i>EduPaint</i>).....	29
Figure 3.4 use case Open for (<i>EduPaint</i>).....	30
Figure 3.5 Use Case tools drawing for (<i>EduPaint</i>).....	32
Figure 3.6 Use Case Alphabet letters in (<i>EduPaint</i>).....	34
Figure 3.7 Use Case Setting colors in (<i>EduPaint</i>).....	36
Figure 3.8 Use Case for children songs (<i>EduPaint</i>).....	38
Figure 3.9 Use Case for Closing (<i>EduPaint</i>).....	40
Figure3.10 Sequence Diagram for (<i>EduPaint</i>).....	43
Figure 3.11 Sequence Diagram for Opening (<i>EduPaint</i>)	44
Figure 3.12 Sequence Diagram for Drawing Tools	45
Figure 3.13 Sequence Diagram for learning alphabet	46
Figure 3.14 Sequence Diagram for songs	47
Figure 3.15 Sequence Diagram for Closing Application Painter	47
Figure 3.16 Collaboration Diagram for (open Interface).....	48

Figure 3.17 Collaboration Diagram for (Drawing Tools).....	49
Figure 3.18 Collaboration Diagram for (Alphabet).....	50
Figure 3.19 Collaboration Diagram for (songs children).....	51
Figure 3.20 Collaboration Diagram for (Closing <i>EduPaint</i>).....	51
Figure 3.21 Class Diagram for (<i>EduPaint</i>).....	53
Figure 4.1The (<i>EduPaint</i>)	59
Figure 5.1 Race (Children).....	71
Figure 5.2 Gender (Children).....	72
Figure 5.3 Ages (Children).....	73
Figure 5.4 Question 1.....	74
Figure 5.5 Race (Teachers and Parents).....	75
Figure 5.6 Gender (Teachers and Parents).....	76
Figure 5.7 Teachers and Parents	77
Figure 5.8 Total number Children.....	78

LIST OF TABLES

Table 3.1 Functional Requirement of <i>EduPaint</i>	25
Table 3.2 Non-functional Requirement of <i>EduPaint</i>	27
Table 4.1. Drawing Tools.....	61
Table 4.2. Setting Colors Tools	63
Table 4.3 Alphabet with Pronunciation tool.....	64
Table 4.4. Songs Tool.....	65
Table 4. 5. Menu tool.....	66
Table 4.6. Tool Tips Tool	68
Table 5.1 Race (Children).....	71
Table 5. 2 Gender (Children).....	72
Table 5.3 Ages (Children).....	73
Table 5.4 Question 1	74
Table 5.5 Race (Teachers and Parents)....	75
Table 5.6 Gender (Teachers and Parents).....	76
Table 5.7 Teachers and Parents	77
Table 5.8 Total Number Children	78
Table 5.9 Question 1.....	79
Table 5.10 Question 2.....	80
Table 5.11 Question 3.....	81

Table 5.12 Question 4.....	82
Table 5-13 Question 5.....	83
Table 5-14 Question 6.....	84
Table 5-15 Question 7.....	85
Table 5-16 Question 8.....	86
Table 5-17 Question 9.....	87
Table 5-18 Question 10.....	88
Table 5-19 Question 11.....	89
Table 5-20 Question 12.....	90
Table 5-21 Question 13.....	91

APPENDIX

APPENDIX A (QUESTIONNAIRE)	110
APPENDIX B (SAMPLES OF THE TEST)	119
APPENDIX C (EDUPAINT CODE)	123

CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

Computers have become ubiquitous at all levels of schooling in developed countries. As technology in general, and information and communication technologies (ICT) in particular, permeate our education systems, there is increasing concern that young children are being “fast forwarded” through the basics of educational uses of ICT.

Plowman and Stephen (2003) argue that computers and ICT can be appropriately used in developing young children. They agree with Haugland (2000a; 2000b) who recommends that three-year old children could already start learning with computers. It is particularly beneficial in terms of its ability in changing the way children think, what they learn, and how they interact with peers and adults (Lynch & Warner, 2004) and to improve children's learning through exploration, creative problem solving, and self-guided instruction (Clements & Samara, 2003).

There are many areas of education in which the ICT has benefited learners (Jones, 2003; Finegan & Austin, 2002). Among the areas noted were improvements in mathematical problem solving and increases in language skills such as vocabulary size and

use, reading and spelling. In addition there are references to increased social development and improved social interaction (Jones, 2003). Hence, in current practice, people are immersed in changing environmental needs to rapidly adapt their knowledge (Sharpe & Gharani, 2001).

Consequently, the traditional learning systems should evolve into electronic environment (e-learning) and readapt to meet the demands of the market and be able to respond to a widespread, huge and diverse learning demand. One of the basic types of e-learning is adapting Interactive Educational Multimedia learning materials into learning activities. It means the learning materials are used to be an instrument of learning. Tutorials and exercises are done virtually using the interactive support. Also more studies discussed the effect of multimedia and their potential for learning and teaching have concentrated on students' knowledge gains as well as on issues concerning the effective design of interactive multimedia environments (Ioannou, A., Brown, S., Gehlbach, H., Boyer, M., Niv-Solomon, A., Janik, L, 2007).

Some of these studies focused on specific multimedia programs that were developed to achieve specific goals. Findings from a study by (Frear, V., & Hirschbuhl, J. J, 1999) indicated that multimedia it has a significant effect on both students' achievement and their problem solving skills. Similarly, (Wydra, E. W, 2001) found that the experimental group had significant improvement gain in self-learning ability apart from of other variables.

The kids will undergo learning process, which comprises of audio, visual, and interactive features via the supports. Distance is discarded because the e-learning content is designed with tools that can be accessed from suitably equipped computer terminals (Australian Flexible Learning Framework, 2008).

Currently, there are many students, children, and kindergartens using the Interactive Educational Multimedia in their learning activities (Liu, 2005). They use it to support of face-to-face participation in the class. In general, children especially between the ages of 4 to 6 years old should be allowed to explore the computers and utilize them according to their own interests.

According to Mark Overmars (2007) drawing application is one of the best early exercises for children. The drawing applications should be specially designed to suit the needs of young children. Particularly, children are not required to be able to read to use the program. Also, rather than asking the user to set all sorts of options it simply gives a large number of different ways of drawing. The best way to learn what the program can do is to simply play with all the buttons. There are normal drawing commands, such as for drawing lines and circles. It could provide extraordinary commands to draw railroads, pipes, bubbles, and grass. Hence, different pens, stamps, clipart, backgrounds, and special effects could be provided to the children (Mark Overmars, 2007).

1.2 PROBLEM STATEMENT

Normal drawing activities require the use of pen, pencil, and paper. Teachers need to be at present. Generally, this is costly in terms of time and efforts. In response to that, (Vernadakis, Avgerinos, Tsitskari, and Zachopoulou, 2005) argue that all features required in drawing activities could be included in drawing applications. In fact, they could be simplified and be more attractive.

Regarding learning alphabets in electronic environment, children aged 4 to 6 years old do not have the ability to use online resources (White, 2006). As an alternative, they go to kindergartens to learn. At the kindergartens, teachers have to deliver correct contents, including correct pronunciations. Hence, the electronic applications could also be utilized by teachers.

The drawing applications by Mark Overmars (2009), Roger Wambolt (2010) and TuxPaint (2009), has been utilized by children widely. However, are lack the educational aspect. It is seen in the way it teaches alphabets (A to Z). As an example, letters are not coupled with any appropriate picture. Besides, in terms of audio cue, it is not well-uttered. On the other hand, most pronunciations are incorrect.

Additionally, the screen layout is also not well designed. In detail, the buttons are small, and some buttons contain many functions, making them difficult for the children to select the drawing tool.

Also, the buttons do not use meaningful metaphor to address their functions. In terms of colors, most buttons are not obvious. In addition, the application is not incorporated with music that can help the children enjoy while drawing or learning the alphabets.

Based on the problems discussed in the previous paragraphs, this study proposes an application that teaches preschool children the feature of drawing using a computer which is particularly suitable for young children who has yet the ability of reading and writing. The overall intention is to provide preschool children with an application to learn drawing and language (letters).

An alternative approach of teaching children at this stage is by allowing them to explore buttons that generates voice pronunciation of alphabets in addition to its shape. This study benefits the teachers and parents of pre-school children especially in guiding the children's progress in drawing and language.

1.3 RESEARCH QUESTIONS

The previous section describes the problems to be solved. Consequently, this study points two questions to ponder.

1. What are the information and content that help children learn drawing and letters?
2. How to evaluate the drawing and learning alphabet program for the children?

1.4 RESEARCH OBJECTIVES

The main objective of this study is to develop an educational drawing and painting application that also educate preschool children with alphabets. In order to achieve the objective, the following sub-objectives are necessary to be achieved:

1. To identify the basic requirements to learn drawing and alphabets that should be incorporated in *EduPaint*.
2. To design and develop the *EduPaint*.
3. To evaluate the *EduPaint* in terms of its effects over the mental skills through learnability, usefulness and ease of use.

1.5 RESEARCH SCOPE

The *EduPaint* is intended for children between 4 and 6 years old in the preschools and kindergartens.

1.6 RESEARCH SIGNIFICANCE

The benefits of this study can be seen in its contributions to different groups, teachers and children.

- Benefits to teachers – The *EduPaint* assists them in educating children in their drawing and learning alphabets. Especially in learning alphabets, they could practice themselves with correct pronunciations before train the children.

- Benefits to children – The children and especially those between 4 and 6 years old will benefit from *EduPaint* as it provides them a venue to express their creativity (drawing) and to learn alphabets. They could learn not only at schools, but also when they are at home. This in a way could accelerate their learning speed.

1.7 REPORT STRUCTURE

This chapter elaborates the background of the study. The problem in existing and widely used painting application is discussed to be the basis of this study. On top of that, the objectives which are outlined to solve the problems are also included. Then, the previous works related to this study follow in the next chapter. Next, the methods of achieving the objectives are discussed in Chapter 3. The *EduPaint* is explained in detail in Chapter 4, which is followed with the testing and its results in Chapter 5. Finally, Chapter 6 follows by concluding the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter highlights previous studies related to this work. Reviewing them is important to shed lights, and confidence to the idea of *EduPaint*. Among the topics inputting ideas into supporting this initiative include the use of ICT in pre-school education, language learning via technologies and their success stories, learning activities via drawing activities, technology integration in teacher education, multimedia supports for learning activities, and interface.

2.2. Use of ICT in Education of Preschool Children

The implications of ICT in early childhood pedagogy started to raise discussion in scholarly early childhood literature. Recently, a consensus has emerged around the potential of ICT in enhancing children's development and learning (Anderson et al., 2007; Brown, 2006; Clements, 1999; deWacht, 2004; Edwards, 2005a, 2005b). In fact, Bolstad (2004) found that computers play a significant role in children's everyday life, while Zevenbergen (2007) has gone a step further referring to young children as "*digital natives*", whose worlds are heavily influenced by technologies.

She argues that children now live in a “*digital habitus*” that has its own particular ways of seeing and acting in the world and that this has implications for early childhood practice. In Malaysia, ICT has been used to facilitate teaching and learning in many early childhood programs as seen in Figure 2.1. Although Cordes and Miller (2000) have expressed concerns about its developmental appropriateness, numerous studies have indicated technology’s positive effects on aspects of children’s cognitive, social, and emotional development (Clements & Sarama, 2003b; Haugland, 2000b; Shade, 1996; Wang & Ching, 2003).



Figure 2.1 ICT in Education

In supports of cognitive development, appropriate software can provide scaffolding for children’s movement toward symbolic thinking (Swaminathan & Wright, 2003). Children may also benefit from enhanced decision-making abilities and longer attention spans (Clements & Sarama, 2003a).

Meanwhile, in facilitating social and emotional growth, developmentally appropriate computer activities can engage children in cooperative learning, such as sharing ideas and solving problems as a group (Heft & Swaminathan, 2002). The computer also serves as a catalyst for peer teaching (Freeman & Somerindyke, 2001). On top of the benefits, the teachers of early childhood programmes must align the use of technology with both the developmental characteristics of young children and the goals of early education (Chen & Chang, 2006).

In a nutshell, with ICT, knowledge can be flexibly passed to students or learners. It is one of the strongest arguments for promoting e-learning, in which it lies in its potentials to improve knowledge (Jiang, Lan, & Zhuang, 2001), and to minimize the dimensional constraints of time and location (Fetaji & Fetaji, 2007). This supports the arguments that electronic environment is important in the education sector (Salim, 2009).

In short, this paragraph and the previous convey a meaning that ICT has been embedded within a broader framework of education reforms in the international arena (Pelgrum & Anderson, 1999) that reflect the necessity for computer awareness even from the preschool period.

One of the most important requirements for application of technologies for e-learning is to create a positive prima facie. Hence, technologies must be logical and transparent; they must offer users with appropriate human-computer interfaces and help/tutoring. Also, they must stimulate primary interest among the users.

All these mechanisms help increasing the success of e-learning activities (Pohradsky et al., 2010). An example to ponder is that the use of the keyboard for interacting with applications is not the standard approach in pre-school education. On a contrary, appropriate interface for pre-school children when working with computers is using mouse, touch pad/panel, or touch display. More interestingly, voice input should be enabled for them (Pohradsky et al., 2010).

2.3. Language Learning via new Technologies

With reference to the advancements in ICT, language learning could be assisted and enhanced by ICT tools (Fallahkhair, Masthoff & Pemberton, 2004). As an example, the paper-based language learning technologies such as dictionaries and books have evolved into laboratories with the use of audio tapes, television programs, Interactive CD ROMs, Internet, and mobile technologies (Sharpe & Gharani, 2001). Currently, various software are available for learning language.

The abilities of using interactive software should be mapped with the real needs of language learners (Fallahkhair, Masthoff & Pemberton, 2004). This makes learning with interactive software with multimedia promising and growing. It has changed teacher's perception as well as learner's about learning. In relation, Neo (2005) found that multimedia mediated instruction with constructivist example motivates learners to work in a couple and create their own solutions to problems.

On the other hand, the development of reading competency is a complex process which is based on both natural development and formal acquisition of a large set of abilities and skills. There are studies stress on the importance of the relationship between pre-reading or early reading skills (such as phonological processing and letter recognition) and reading competency. The learning value of the computer-based tuition of early reading skills has been investigated (Chera & Wood, 2003; Hecht & Close, 2002; Segers & Verhoeven, 2002).

They found that the main features of computer applications that are relevant to teaching phonemic awareness include spoken instructions by a high-quality digitized voice, corrective feedback, high quality graphics, and the game-like presentation of training (Mioduser, Tur-Kaspa, & Leitner, 2000). However, determining whether phonemic awareness training will be of value for any given child is a difficult matter because very little is known about variability in response to the training (Torgesen, 2000).

Besides, a number of studies have shown the potentials of ICT to enhance phonological awareness in children with reading difficulties. The existing literature has shown that segmented speech feedback is often effective in increasing phonological awareness (Olson, Wise, Ring, & Johnson, 1997; Van Dal, Reitsma, & Van Der Leig, 1994).

Mitchell and Fox (2001) and Wise, Ring, and Olson (1999) compared children who have been exposed to different forms of speech segmentation (whole word feedback or segmented word feedback). It was found that the most common method of training phonological skills involves different sub-lexical units such as rime, syllable or phoneme. Also there is substantial evidence that phonological processing is an important precursor of reading acquisition.

On top of that, the relationship between phonological skills and early reading is considerable (Castles & Coltheart, 2004; Goswami, 1999; Seymour, & Bolik, 1999). More precisely, phonemic awareness which is the ability to isolate and manipulate the segments of speech at the level of the single phoneme (Morais, 2003) is an important source of variability in reading.

2.4. Learning via Drawing

Drawing is the act of creating a representation of any object by the use of lines and/or value. Since drawing is a form of visual expression, drawing is thus used as a mean for developing creativity among the preschoolers in Malaysia (Hanayanti, 2008). With the

advancement of computing technologies, there are a number of digital drawing applications developed to help enhance the children's creativity (Sidhu, 2004).

Some examples of these applications are TuxPaint, Drawing for Children, and Shidonni. These applications can be downloaded from the websites respectively. In our opinion, these applications have better user interfaces than the existing PC drawing application, MS Paint. From our study, we found that these applications were primarily designed for the children (Hanayanti Hafit, 2009).

Children's drawings have an order of development, and that accompanies the development of motor skills, emotional development, psychosocial development and the development of perception. Children draw "what they know" in their own style, in which fun is enhanced with the social interaction with other children (Kendrick & McKay, 2004).

Educational technologists believe that a child's academic performance can be enhanced with the use of interactive computing technologies such as multimedia and web applications as depicted in Figure 2.2. These technologies can help motivate children to learn, help them understand concepts, and thus help them develop problem-solving skills (Sivin-Kachala & Bialo, 2000).



Figure 2.2 Learning via Drawing

When discussing fun in the context of usability, the most closely related notion is user satisfaction. In this study, fun can be interpreted as first, a result of ease of use and second, as features to be added on the user interface design.

Drawing applications have features that can stimulate fun environment. As an illustration, the shapes and stamp in adding special effects to the drawings always creates fun. In children's learning experience, fun is a very important factor and they learn from playing. In addition, fun is further enhanced with the social interaction, in which children have more fun when they could do and share the drawings with their friends.

2.5. Technology Integration in Education

According to Salim (2009), the incorporation of technology does not by and of itself transform teaching or learning. But, it can provide teachers access to new ideas and information that is difficult to find and help them present information using pictures. The most important and critical factor is how the technology is used for instruction.

Many teachers found that technologies can help them in improving learner learning and motivation, address learners with different learning styles, expose learners to a wider world of information and experts, and implement new teaching techniques (Almekhlafi, 2006). In cases where technology is used, positive results appear such as accelerating change (Whetstone & Carr-Chellman, 2001; Schnackenberg, Luik, Nisan & Servant, 2001). Similarly, Moreno, Mayer, Spires, and Lester (2001) found that the effect of educational technology on promoting meaningful learning in multimedia lessons was common (Salim, 2009).

Salim (2009) adds that the environments which appeal to more than one sensory organ positively affect the stability. It shows that people can remember 20% of what they have only seen, 40% of what they have seen and heard, 75% of what they have seen, heard, and done (Neo & Neo, 2001). In a similar research, Bass (2003) revealed that human remember 10% of what they have read, 20% of what they have heard, 30% of what they have both seen and heard, 50% of what somebody has explained to them and 90% of what they have done themselves. In this context, multimedia applications which generally

combine of text, sound, graphics, and animation that encourage self-exploration provide a more effective and longer lasting learning experience (Salim, Trigui Mohamed, 2009).

On the other hand, children's interactions with computers were frequently referred to by adults and children, as "*playing with the computer*" in the same way as they would talk about playing with the bricks or toys. Children's encounters with books, crayons, and paints are not referred to as play activities, probably because their role in the curriculum was easily identified and practitioners were used to recording children's development in the areas of reading, writing, and drawing, the culture of pre-school practice values a child-centred approach. This perspective is reflected in the emphasis on children choosing when to play with the computer and which software to use (Plowman & Stephen, 2005).

2.6 Multimedia

The Cambridge Handbook of Multimedia Learning constitutes the world's first handbook devoted to comprehensive coverage of research and theory in the field of multimedia learning. Multimedia learning is defined as learning from words (e.g., spoken or printed text) and pictures (e.g., illustrations, photos, maps, graphs, animation, or video). The focus of this handbook is on how people learn from words and pictures in computer-based environments. Multimedia environments include online instructional presentations, interactive lessons, e-courses, simulation games, virtual reality, and computer-supported in-class presentations.

The Cambridge Handbook of Multimedia Learning seeks to establish what works (i.e., to determine which features of a multimedia lesson affect learning), to explain how it works (i.e., to ground research in cognitive theory), and to consider (Mayer, 2002), Multimedia can show material in the way we think. It allows us to review specific aspects as often as we like, skipping around as necessary. It is motivating, as it allows the user to take charge of his or her learning. Multimedia can provide feedback, adjust the standard of difficulty, and evaluate skills.

As discussed in earlier paragraphs, multimedia supports drawing and language learning. In that context, Computer Assisted Language Learning is a form of computer-based learning that plays roles. It has two valuable characteristics: bidirectional learning and individualized learning (Wikipedia, 2009).

Babbitt (1993) argues that previously, Computer Assisted Language Learning software was limited to text (Siribodhi, 1995). Materials have been found to be useful and efficient as a complement for teachers aimed at instruction for achieving for elementary students.

Babbitt (1993) also adds that interactive multimedia software have been utilized successfully. Researchers are showing interest in using multimedia software to test various language learning outcomes. Then, Raphan (1996) developed an interactive multimedia prototype used to conduct a pilot study to determine how students of English as a Second Language programme would manipulate the multimedia screen with simultaneous audio, visual, and.

The result showed that students adapted to the multimedia information quickly. Additionally, students interacted positively with the system and commented on the usefulness of the individualized instruction. There was also an improvement in their reading ability. In a nutshell, Raphan (1996) confessed that students can learn best from presentations that most closely simulate reality.

Also, graphic and drawing applications are very important in influencing the students (children). It is the graphics that would create the first impression of any multimedia project. These tools are, therefore, very useful in ensuring the desired capability in terms of drawing and painting. Painting and drawing tools generally come with a graphical user interface with pull down menus for quick selection. Almost all kinds of possible shapes can be created resized (Sidhu, 2008).

2.6.1 Designing the Interface

According to Common Front Group (1995) and Weeks, Batatia, Sotudeh, Maierhofer, and England (1998), the term ‘interface’ refers to the methods and devices that are used to accommodate interaction between machines and the human beings who use them (users). Since so the media and means of educational are available to the user interface designer, it is very easy to overwhelm and confuse the users of these products. Some critical principles of multimedia and educational interface design in human aspect will be considered.

The interface design are based on the way people think and perceive information in order to produce a user interface that are easy and comfortable for users to learn and use (Reddi & Mishra, 2003).

Application interface should be able to keep the human attention. For example, the interface should be fun to use to excite the user's interest and actions. In relation, Larry Najjar, a human factor expert found that the use of postal colors could attract user's attention. He states the scientists also believe that these kinds of colors let people focus on small objects better and are less likely to cause objects to appear to float on the display (Najjar, 1998).

Human perception is another critical aspect in application interface designs. Designers or developers should understand the accessibility of objects in the screen architecture. For example, title should be on the top, progressive information should be from left to right and a next button should be on the right. Besides, designers need to consider the affordability of objects in the screen architecture (McGriff, 2000).

Sounds are important elements in multimedia application. Most of the sound clips used in the application were edited using Sound forge and Cool Edit pro before imported to java applet library. Audio used to enhance the effectiveness of the program. Java applet AudioClip library is compatible with various sound files: WAV, QuickTime, MIDI and MP3. The application mostly used WAV and MP3 files.

2.9 Summary

This chapter elaborates the basic concepts of ICT in Education, e-learning for preschool, learning via drawing, interactivity, playing with the computer, multimedia and the advantages of implementing multimedia educational applications. It reviews related literatures about educational application development. It also reveals that researches agree that interactive multimedia applications provide better learning environment than classical classroom. Several scholars have addressed the utilization of multimedia software from different perspectives and various approaches of developing interactive software which mostly guarantee efficient dissemination of information have been identified. The next chapter describes the methodology used in realizing the research objectives as stated in Chapter 1.

CHAPTER THREE

RESEARCH METHODOLOGY

Research methodology reflects the methods and techniques used in carrying out the study. In this study, the General Research Design Methodology developed by Vaishnavi and Kuechler (2008) is adapted. Figure 3.1 explains that it consists of five phases namely Awareness of problem, Suggestion, Development, Evaluation, and Conclusion. Each phase is elaborated in the following sections.

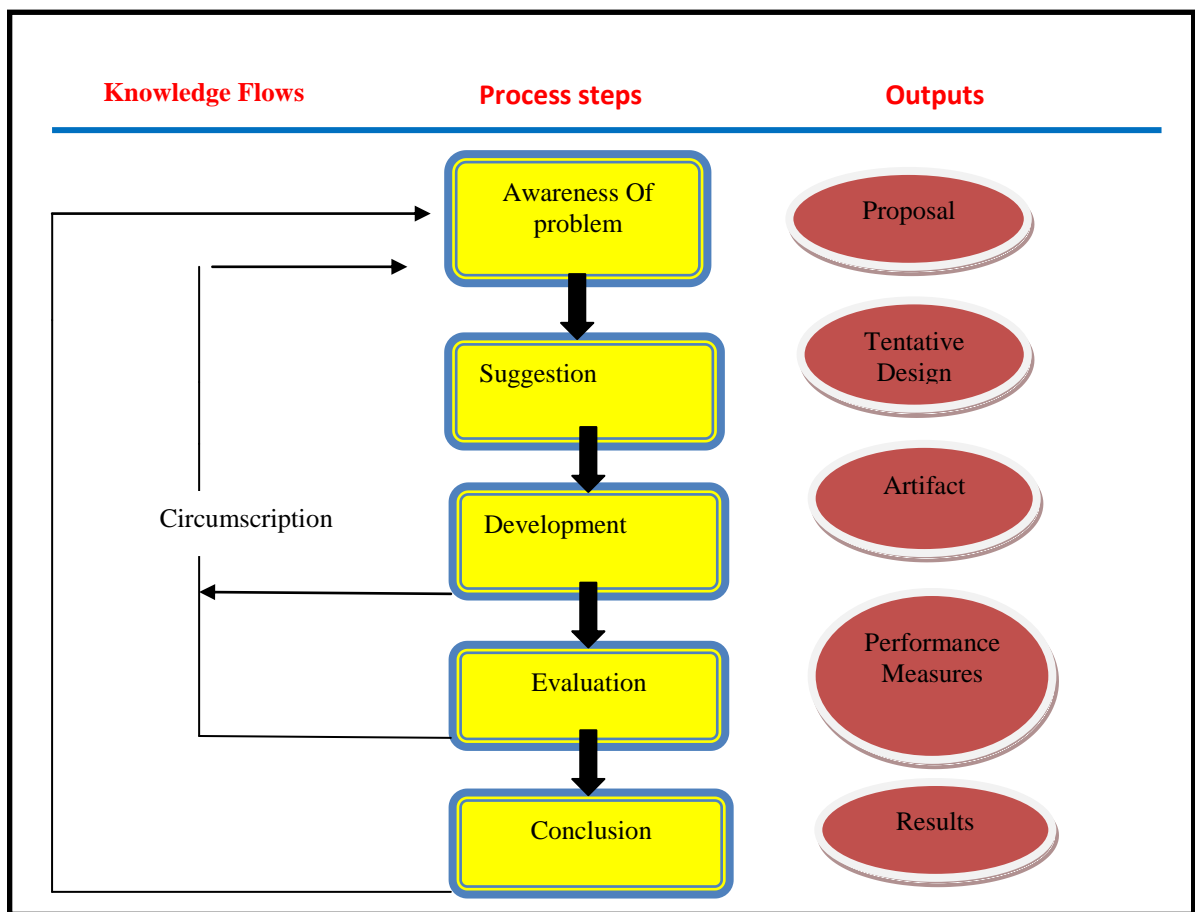


Figure 3.1: General Methodology for Design Research (GMDR) (Vaishnavi & Kuechler, 2008)

3.1 AWARENESS OF A PROBLEM

There are a lot of educational applications designed and developed for children and adults of all ages. However, the phenomenon exhibits that most of those who use the applications are adults. On a contrary, not many children use them. One of the reasons is because they are designed with a semi-complex interface and therefore, the children cannot use and learn from them (Overmars, 2007). In regards to this study, most of drawing applications lack the educational aspects, fun elements, and supports for cognitive pleasure. In addition, applications for children should support for intelligence development, which is still lacking.

3.2 SUGGESTION

In response to the problem as described in the previous section, this study intends to propose an idea that merges drawing activities with learning alphabets. The application is embedded with supports for mental pleasure elements, and is named *EduPaint*. In conjunction, Figure 3.2 illustrates the concept of *EduPaint*, in which it provides drawing tools and pronunciation kit.

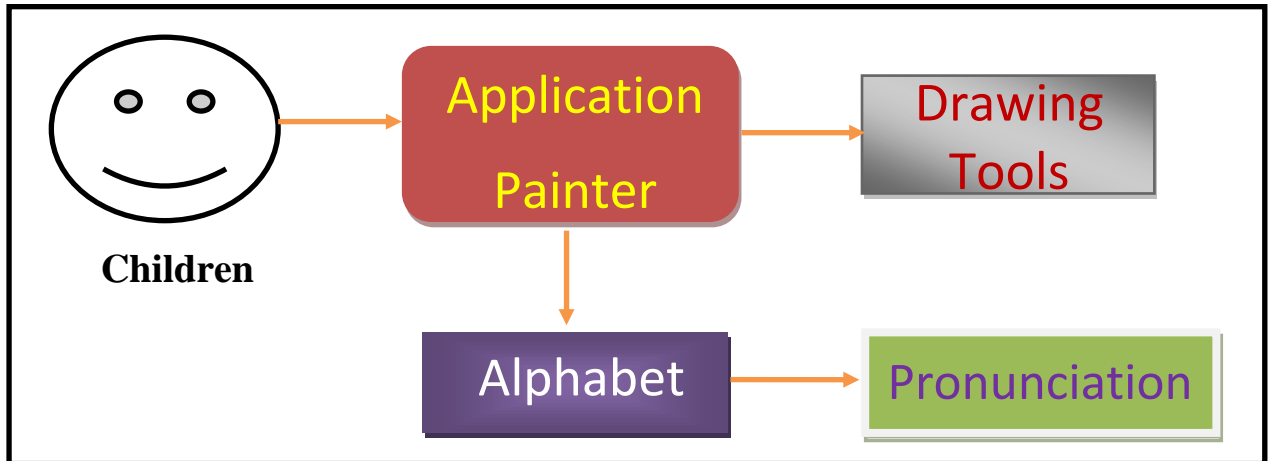


Figure 3.2 Model Application Painters for Children

3.2.1 Application Requirements

This section describes the requirements of the *EduPaint* which is divided into functional and non-functional requirements (Chung & do Prado Leite, 2009).

Functional Requirements

Functional requirements are intended to capture the anticipated behavior of *EduPaint*. In relation, Tilley and Huang (2003) recommend to use the Unified Modeling Language (UML) for modeling *EduPaint* because it is a modern software application. In *EduPaint*, the requirements are prioritized based on a scheme as listed below:

M – Mandatory requirements (something the application must do).

D – Desirable requirements (something the application preferably should do).

O – Optional requirements (something the application may do).

Further, Table 3.1 summarizes the functional requirements of *EduPaint* and describes each of them.

Table 3.1 Functional requirement of *EduPaint*

No	Requirement ID	Requirement Description	Priority
	EP-F-PC _01	Open Interface Application	
1	EP-F-PC _01	Open the <i>EduPaint</i> by the user (teachers or children) with sound	M
	EP-F-PC _01_01	Tools Drawing	
2	EP-F-PC 01_01_01	Geometric Shapes (Square - Circle - Line - Oblong - polygons)	D
3	EP-F-PC 01_01_02	Basic Basic tools (Pen - Rubber - Airbrush - Clean Items -Fill Forms- Undo Item – Redo Item)	D
4	EP-F-PC 01_01_03	The mouse pointer shows a brief comment to the work of each button	O
	EP-F-PC _01_02	The Alphabet letters	
6	EP-F-PC _01_02_01	Letters (A to Z) with example	M
7	EP-F-PC _01_02_02	Sound to pronunciation of the letters	M
8	EP-F-PC _01_02_03	The mouse pointer shows a brief comment to the work of each button	O
	EP-F-PC _01_03	Set of Colors	
9	EP-F-PC _01_03	Set of a wide of colors with Custom colors	D
	EP-F-PC _01_05	Children songs	

13	EP-F-PC _01_05	Children songs include (alphabet song, animals song, Song of happiness)	D
	EP-F-PC _07	Close Application	
15	EP-F-PC _07	Close application through the user (Teachers And Children).	M

Non Functional Requirements

Essentially a software system's utility is determined by both its functionality and its non-functional characteristics, such as usability, flexibility, performance, interoperability (Chung & do Prado Leite, 2009). This study refers the non-functional requirements to elements that capture properties for the *EduPaint* that deals with performance and quality or features that are not fundamental for the *EduPaint* to work. They are however important as they are often properties that are desired by the user (Teachers and Children) (Ghezzi & Tamburrelli, 2009). By utilizing the same prioritization as in functional requirements, Table 3.2 summarizes the non-functional requirements for the *EduPaint*.

Table 3.2 Non Functional requirement of *EduPaint*

No.	Requirement ID	Requirement Description	Priority
	EP-F-PC _08	Usability issues	
16	EP-F-PC _08_01	The <i>EduPaint</i> must provide easy to open.	M
17	EP-F-PC _08_02	The <i>EduPaint</i> must provide a big button and easy.	M
	EP-F-PC _09	Understand ability	
18	EP-F-PC _09_1	The <i>EduPaint</i> should be easy to understand.	M
19	EP-F-PC _09_2	The <i>EduPaint</i> should be easy to use.	M
20	EP-F-PC _09_3	The <i>EduPaint</i> should be has a beautiful interface	M
	EP-F-PC _010	Performance requirement	
21	EP-F-PC _10_01	The <i>EduPaint</i> must be executed the tools in real time.	M
22	EP-F-PC _109_02	The <i>EduPaint</i> should be available to full size (800 x 1024)	M

3.2.2 Design of *EduPaint*

Application design is the activity of proceeding from a distinguished set of requirements of *EduPaint* to a design that meets those requirements (Daintith, 2009). The design includes UML diagrams, and the architecture design that have the use case diagram, sequence diagrams, and class diagram (Dennis, Wixom, & Tegarden, 2009).

In regards to *EduPaint* the UML diagrams are exhibited in the analysis and design part from this chapter. In detail, the use case diagram, active diagram, class diagram, sequence diagram, and collaboration diagram are described to represent the complex computations especially at the architectural level (The rose JADE, 2003).

Also, this study makes use of Rational Rose allows to take advantage of iterative development (Rational Rose, 2000). The Unified Modeling Language (UML) is a graphical language for specifying Display, building and documenting artifacts of software intensive systems. UML represents the unification of efforts to build a series of shortcuts for the expression, patterns of object-oriented analysis and design (OOAD) under the auspices of the Object Management Group of matter (OMG) (Ojo & Estevez, 2005).

Use Case Diagram

The Use case Diagram for *EduPaint* is illustrated in Figure 3.3. It explains that *EduPaint* consists of two main components; the actor and use case. In this study, the actor is the children and their teachers.

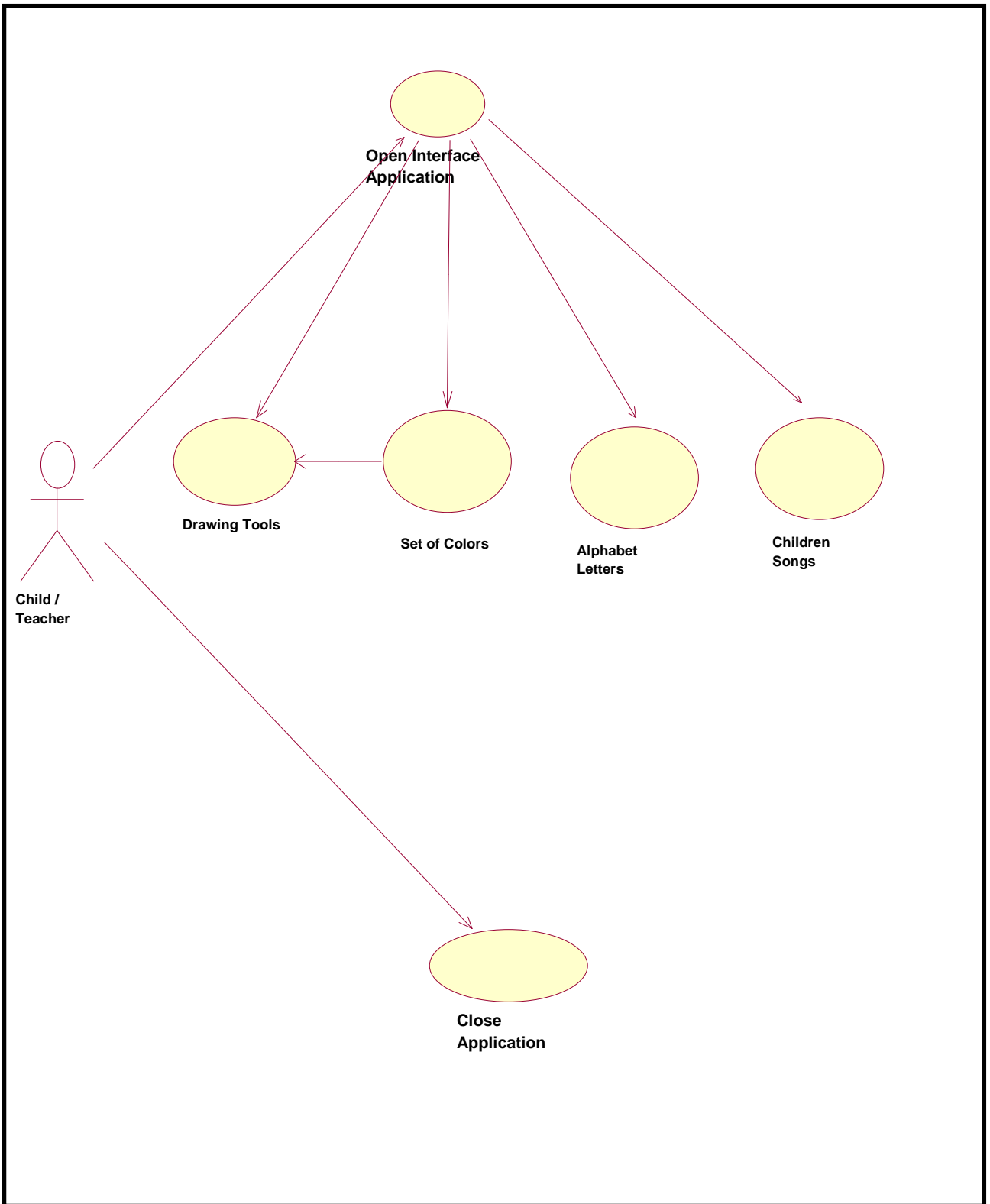


Figure 3.3 Use Case Diagrams for *EduPaint*

Use case specification for (*EduPaint*)

This section details out the specification of *EduPaint*. Each task is represented with a use case and described in terms of appropriate attributes.

Use case for Open *EduPaint*

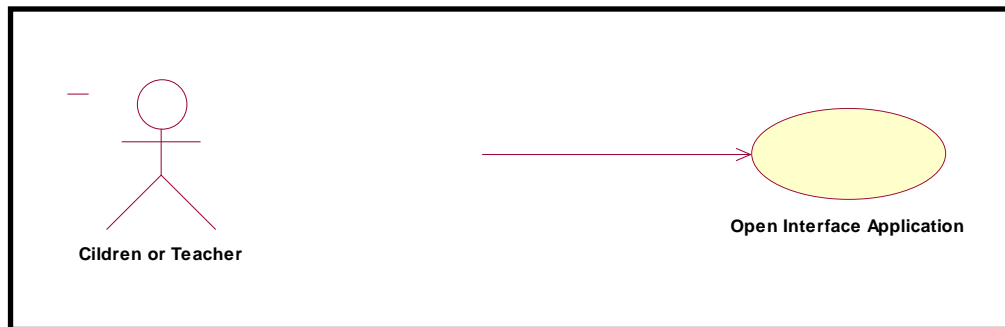


Figure 3.4 Use case for open *EduPaint*

A. Brief description

The use case in Figure 3.4 shows that the *EduPaint* can be opened by both the children and the Teacher.

B. Pre-Conditions

Not Applicable.

C. Characteristic of Activation

Login use case (Open) is done by both the children and the teachers.

D. Flow of Events

I. Basic Flow of *EduPaint*

1. This use case begins when the users (child / teacher) clicks on the 'open' button.
2. The *EduPaint* will display the main page.
3. The users will use the drawing tools and alphabet.
4. The users will use the alphabet with example for each letter, and the correct pronunciation.

II. Alternative Flow

Not Applicable.

III. Exceptional Flow

Not Applicable.

E. POST-CONDITIONS

Not Applicable.

F. RULE

Not Applicable.

G. Constraint

Not Applicable.

Use case for using drawing tools

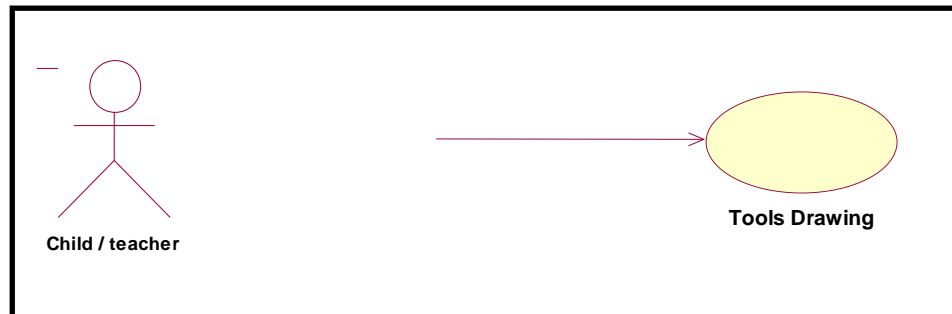


Figure 3.5 Use Case tools drawing for (*EduPaint*)

A. Brief Description

The use of drawing tools in which its use case is depicted in Figure 3.5 is initiated by the users. This use case enables the children and teachers to use the drawing tools. There are four components of drawing tools: geometrical shapes, basic tools, set of colors, and tool-tips mouse pointer.

B. Pre-Conditions (Geometric Shapes)

Users have to use mouse to use work with the geometrical shapes. Among of the shapes include square, circle, line, oblong, and polygons.

C. Pre-Conditions (Basic Tools)

Users have to use mouse to use work with the geometrical shapes. Among of the basic tools include pen, rubber, airbrush, clean items, fill forms, undo items, and redo items.

E. Pre-Conditions (Set of Colors)

Users have to use mouse to work with colors.

F. Pre-conditions (Tool-tips Mouse Pointer)

Users roll the mouse over the buttons to see the descriptions of the buttons.

G. Characteristic of Activation

This task (Drawing tool) is initiated by children and teachers.

H. Flow of Events

I. Basic Flow of *EduPaint*

1. This use case begins when the users click the 'drawing tool' button.
2. The *EduPaint* will display the drawing tool page.

II. Alternative Flow

Not Applicable.

III. Exceptional Flow

Not Applicable.

I. Post-Conditions

Not Applicable.

J. Rule

Not Applicable.

Use case for The Alphabets

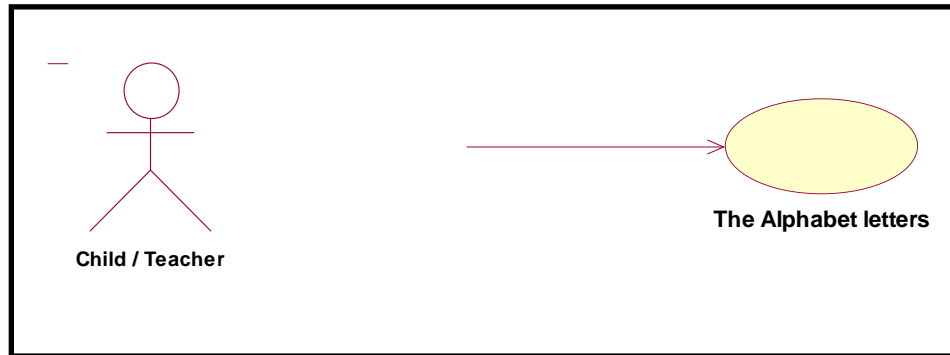


Figure 3.6 Use case for alphabet in *EduPaint*

A. Brief Description

This task which is depicted in Figure 3.6 is initiated by the users. It enables the children and teachers to use the alphabets with sound and example. It consists of three components: Letters from A to Z with examples sound of pronunciation of the letters, and tool-tips mouse pointer.

B. Pre-Conditions (Letters A to Z with Example)

Users must use the mouse to use the letters (from A to Z with examples of pictures).

C. Pre-Conditions (Sound to Pronunciation of the Letters)

Users have to use the mouse to listen to the pronunciation of the Letters.

D. Pre-conditions (Tool-tips Mouse Pointer)

Users have to roll the mouse over the buttons to see the descriptions of the buttons.

E. Characteristic of Activation

This task (learn alphabets) is initiated by the children and teachers.

F. Flow of Events

I. Basic Flow of *EduPaint*

1. This use case begins when the users click the 'alphabets' button.
2. The *EduPaint* will display the learn alphabet page.

II. Alternative Flow

Not Applicable.

III. Exceptional Flow

Not Applicable.

IV. Post-Conditions

Not Applicable.

G. Rule

Not Applicable.

H. Constraint

Not Applicable.

Use case for setting colors

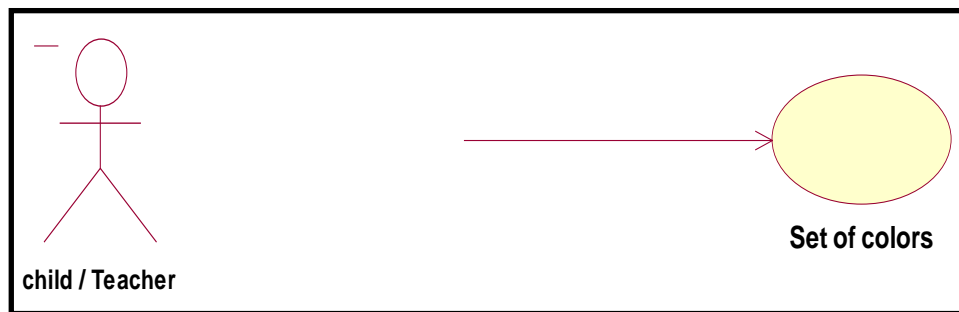


Figure 3.7 Use case for setting colors in *EduPaint*

A. Brief Description

The set color task in which its use case is depicted in Figure 3.7 is initiated by the users. It enables the children and teachers to use the set of colors.

B. Pre-Conditions (set colors)

Users have to use the mouse to use colors.

C. Characteristic of Activation

All the mouse clicks are done by children and teachers.

D. Flow of Events

I. Basic Flow of *EduPaint*

1. It begins when the users click on the 'set of colors' button.
2. The *EduPaint* will Display the window for set of colors.

II. Alternative Flow

Not Applicable.

III. Exceptional Flow

Not Applicable.

IV. Post-Conditions

Not Applicable.

E. Rule

Not Applicable.

F. Constraint

Not Applicable.

Use case for children songs

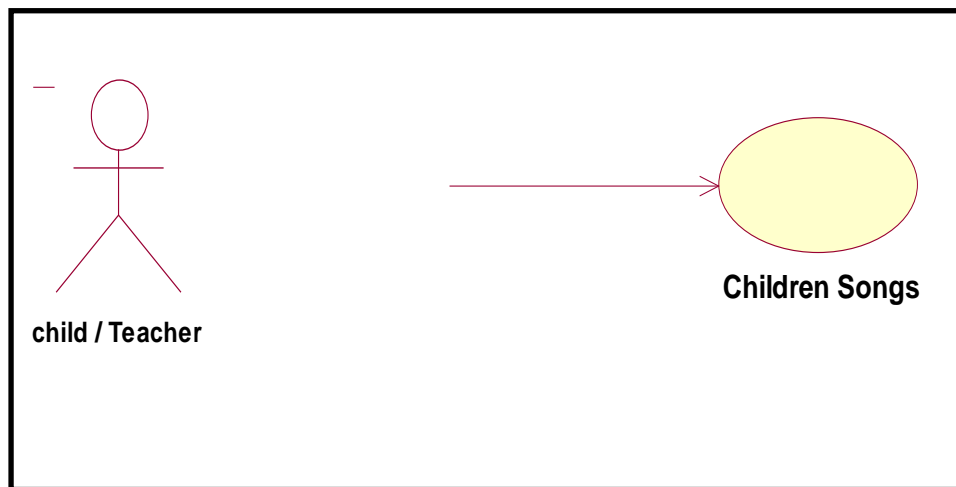


Figure 3.8 Use case for children songs in *EduPaint*

A. Brief Description

The children song task is represented by the use case in Figure 3.8. It shows that the users will do the task, and the *EduPaint* enables the children and teachers to listen to the songs.

B. Pre-Conditions

Users must use the mouse to listen to the songs for children.

C. Characteristic of Activation

This task is performed by children and teachers.

D. Flow of events

I. Basic flow

1. This use case begins when the users click the song button.
2. The *EduPaint* will play the song.

II. Alternative flow

Not Applicable.

III. Exceptional flow

Not Applicable.

E. Post-conditions

Not Applicable.

F. Rule

Not Applicable.

G. Constraint

Not Applicable.

Use case for closing the *EduPaint*



Figure 3.9 Use case for closing the *EduPaint*

A. Brief Description

When users have finished using the *EduPaint*, they can close the application. The use case is depicted in Figure 3.9.

B.2 Pre-Conditions

The users must use the mouse to close the *EduPaint*.

C. Characteristic of Activation

This task is done by the children and teachers.

3.2.4.8.4 Flow of events

I. Basic flow

1. The use case begins when the users (children and teachers) click on the 'close' button.
2. Then the *EduPaint* is closed.

II. Alternative flow

Not applicable.

III. Exceptional flow

Not applicable.

D. Post-conditions

Not applicable.

E. Rule

Not Applicable

F. Constraint

Not Applicable.

Sequence Diagram for *EduPaint*

A sequence diagram consists of objects for the application. Objects are represented exactly how they are represented in all UML diagrams as rectangles to emphasize the class name in the rectangle. This is the most popular UML diagram for modeling dynamic artifacts and is used for the purposes of analysis and design. In this study, it focuses on identifying the behavior within the *EduPaint* (Chitins, Tiwari & Ananthamurthy, 2002). It represents the sequence of events through the opening of the *EduPaint* as a first stage and then moves on to the stage of using the drawing tools or the alphabets and finally to the closing stage. The whole process is depicted in Figure 3.10 and Figure 3.11.

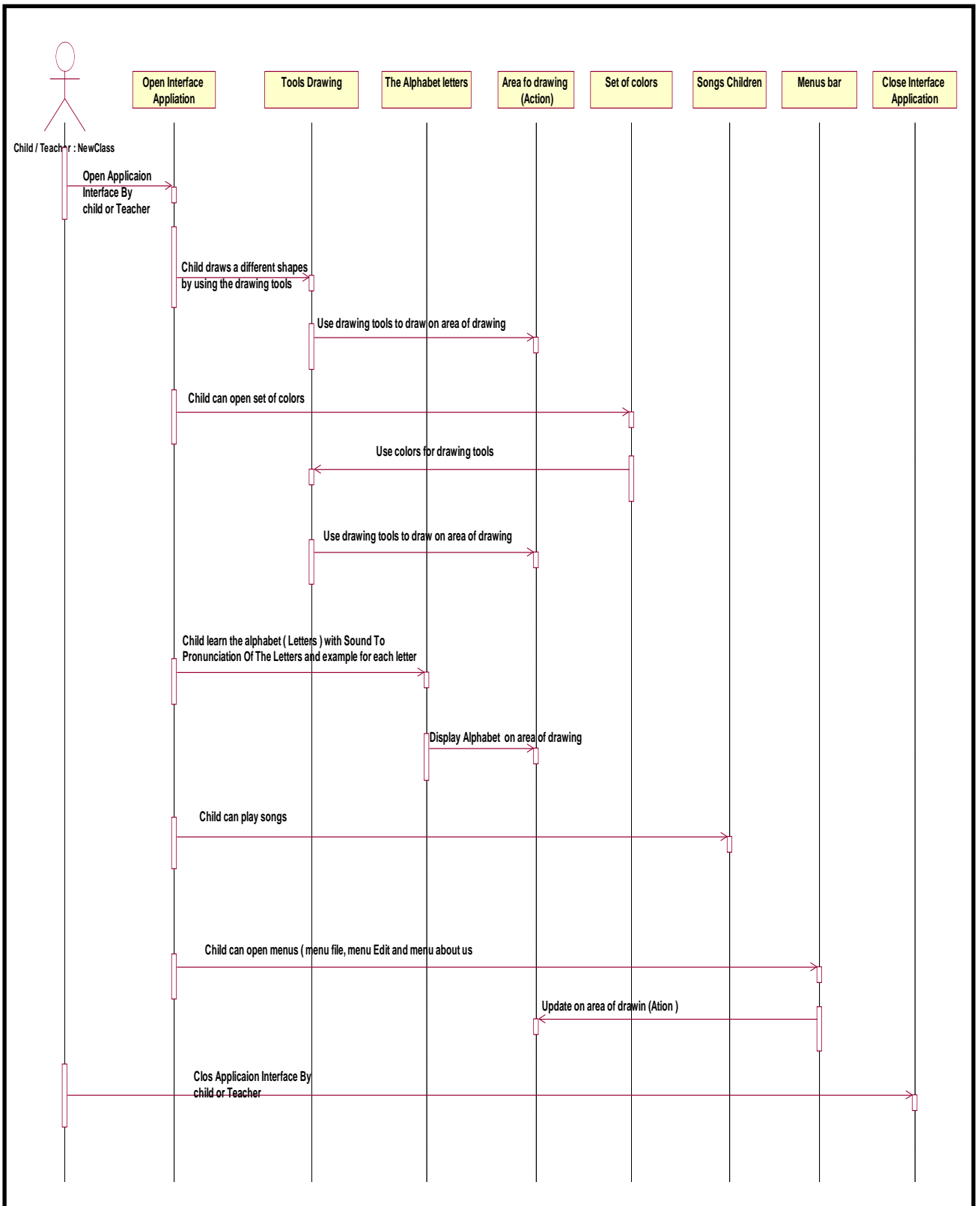


Figure 3.10 Sequence diagram for *EduPaint*

Sequence diagram for opening the *EduPaint*

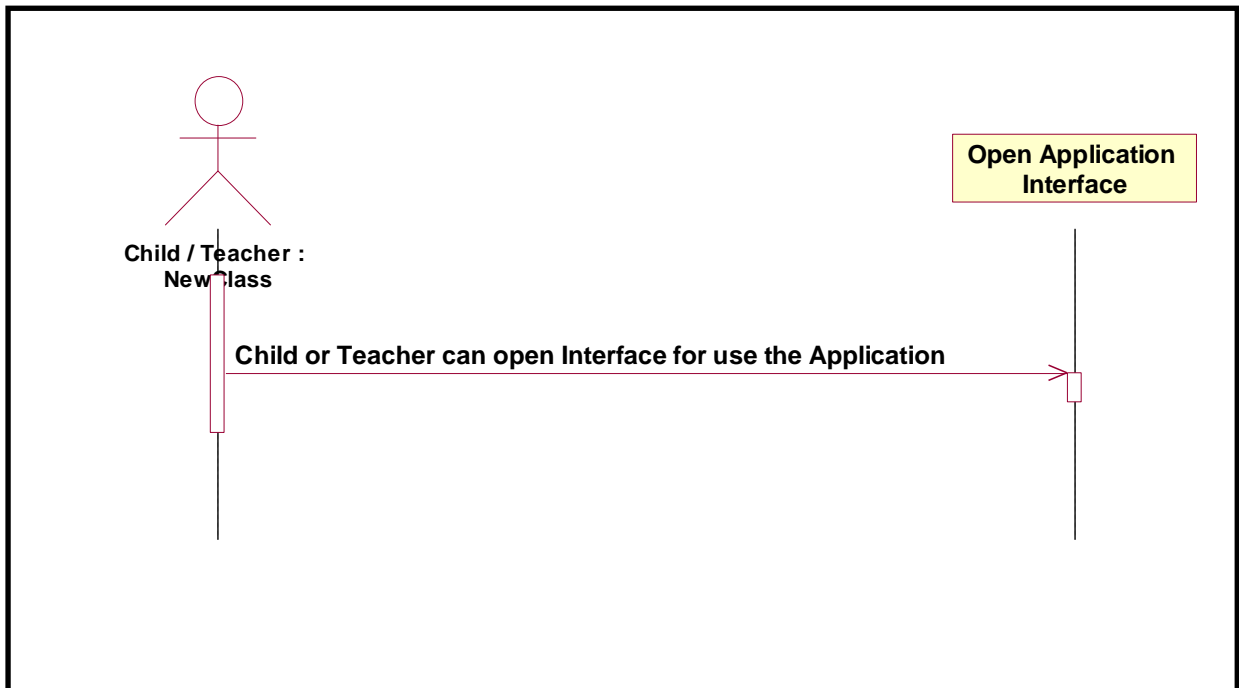


Figure 3.11 Sequence diagram for opening the *EduPaint*

Sequence Diagram for Drawing Tools

At this stage the users have to click the appropriate button to use the drawing tools (for each one) that include geometrical shapes (square, circle, line, oblong, and polygons), and basic tools (pen, rubber, airbrush, clean items, fill forms, undo item, and redo item). Then, the users have to click in the drawing area to perform intended actions. AT the same time, the mouse pointer displays the tool tips to describe the functions of each button. These tasks are visualized in the sequence diagram in Figure 3.12.

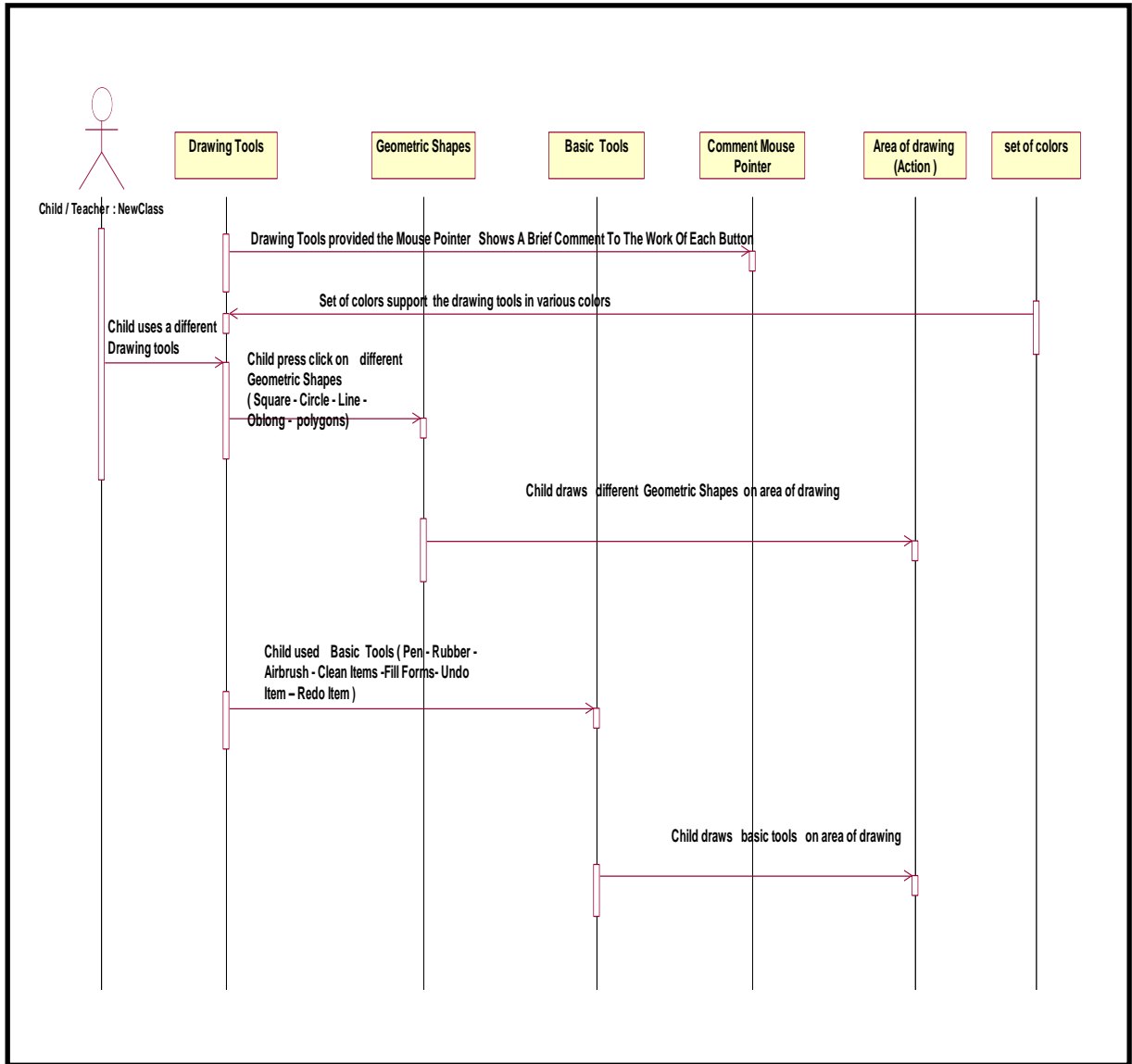


Figure 3.12 Sequence diagram for drawing tools

Sequence diagram for learning alphabets

The steps to learn alphabets begin with users click the 'alphabet' button, and then they click in the drawing area to perform intended action. The *EduPaint* displays letter

with examples of pictures together with the pronunciation of the selected letter. At the same time, the mouse pointer displays the tool tips that describe the functions of the button. The sequence diagram for these tasks is displayed in Figure 3.13.

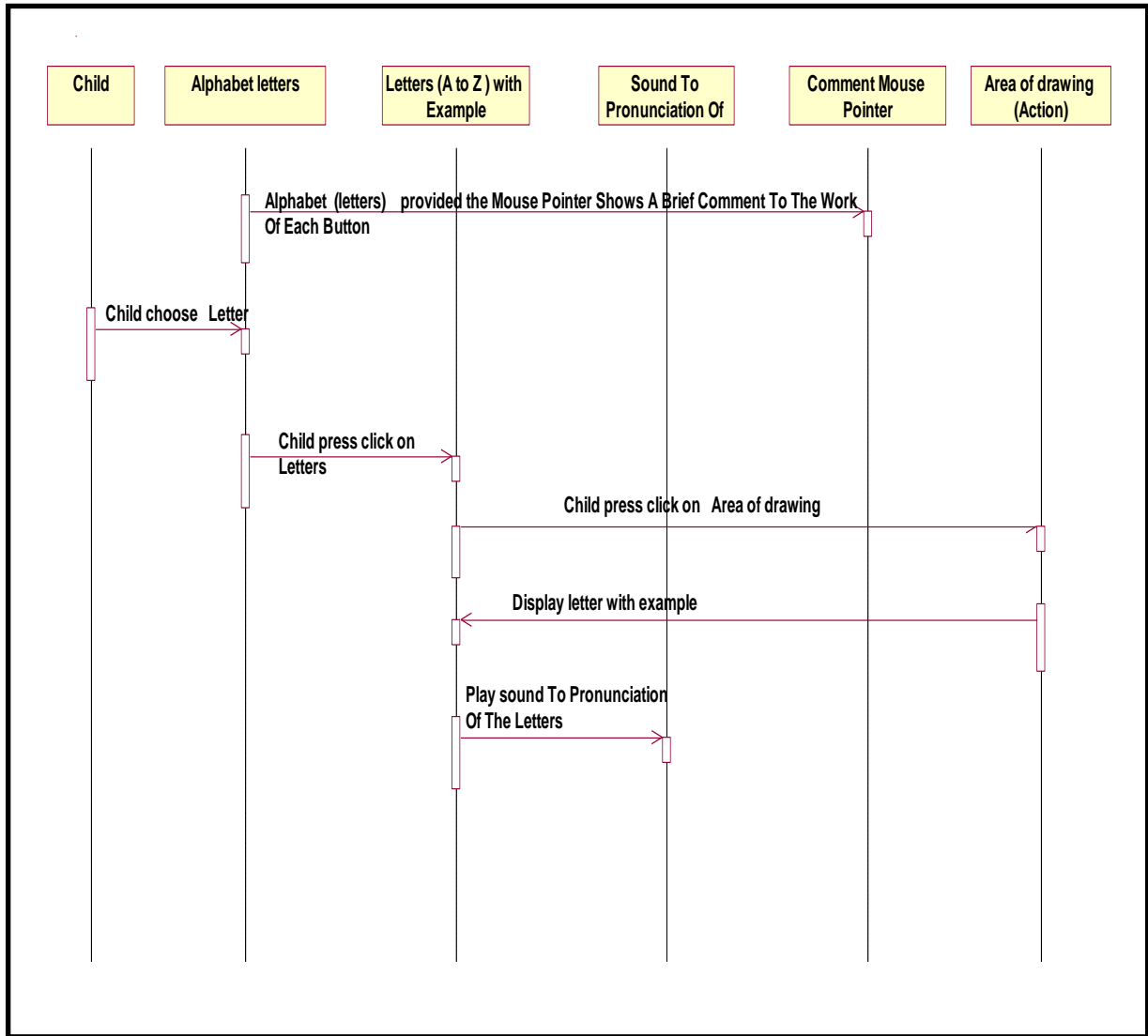


Figure 3.13 Sequence diagram for learning alphabets

Sequence diagram for listening to songs

The children start by clicking the 'songs' button to play music. They will also click 'menu' to save the work, open file, create a new file, undo, redo, and set colors on the area of drawing as seen in Figure 3.14.

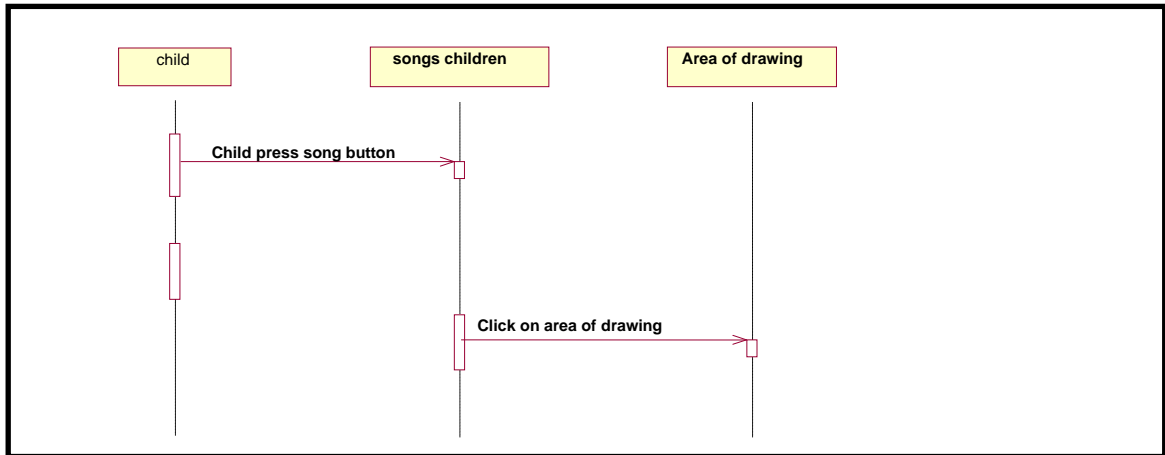


Figure 3.14 Sequence diagram for songs

Sequence diagram for closing the *EduPaint*

At this stage the children and teachers can close the *EduPaint*, in which the sequence is depicted in Figure 3.15.

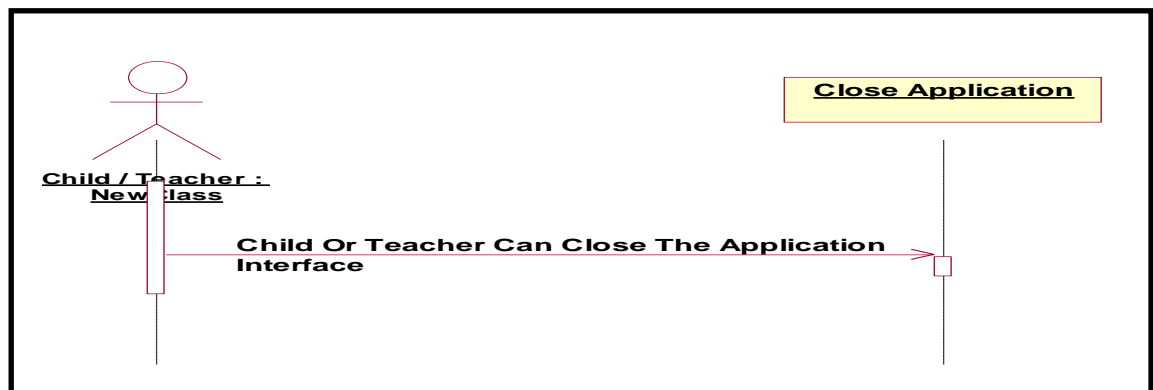


Figure 3.15 Sequence Diagram for closing Application Painter

Collaboration diagram for *EduPaint*

Collaboration diagrams, similar to sequence diagrams, visualize how objects interact. Nevertheless instead of showing the sequence of events by the layout in the diagram, the collaboration diagrams show the sequence in phases of the *EduPaint*. This makes it simpler to illustrate how the objects are linked together (Bultan, Ferguson, & Fu, 2009).

In this study, the collaboration diagrams depict the tasks in the *EduPaint*. It shows the tasks from opening the *EduPaint* and then moves on to the stage of using the drawing tools and set of colors, the alphabets, children songs and menus, and then the users exit from the *EduPaint*. Accordingly, the collaboration diagrams are divided into opening the *EduPaint* (Figure 3.16), drawing tool (Figure 3.17), alphabet (Figure 3.18), song (Figure 3.19), and closing the *EduPaint* (Figure 3.20).

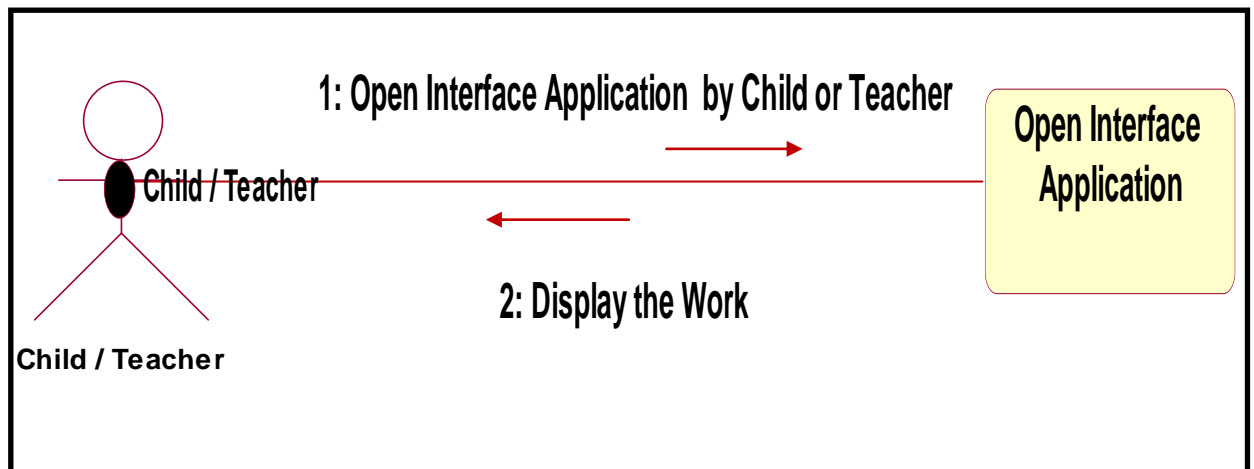


Figure 3.16 Collaboration Diagram for (open Interface)

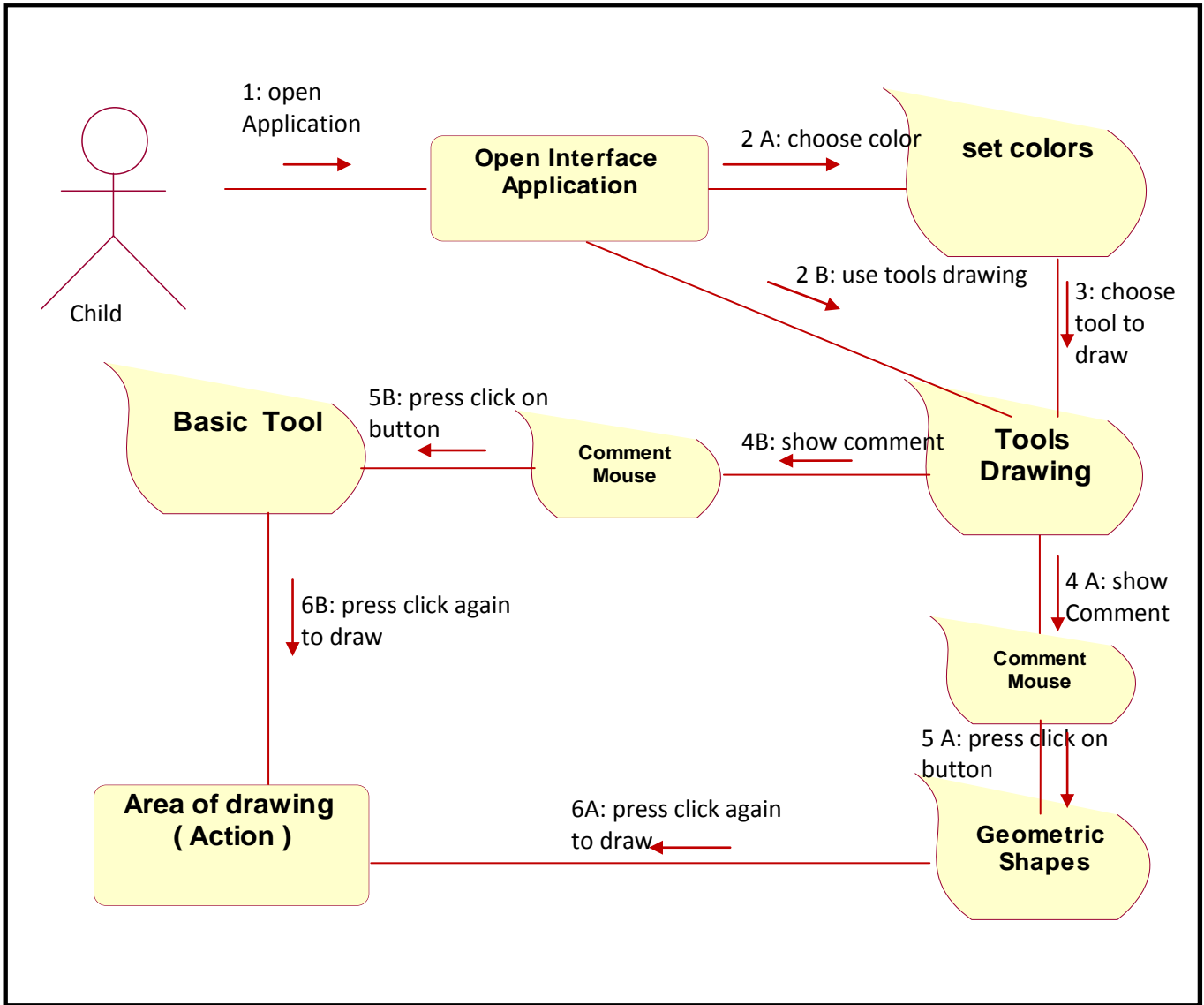


Figure 3.17 Collaboration diagram for drawing tools

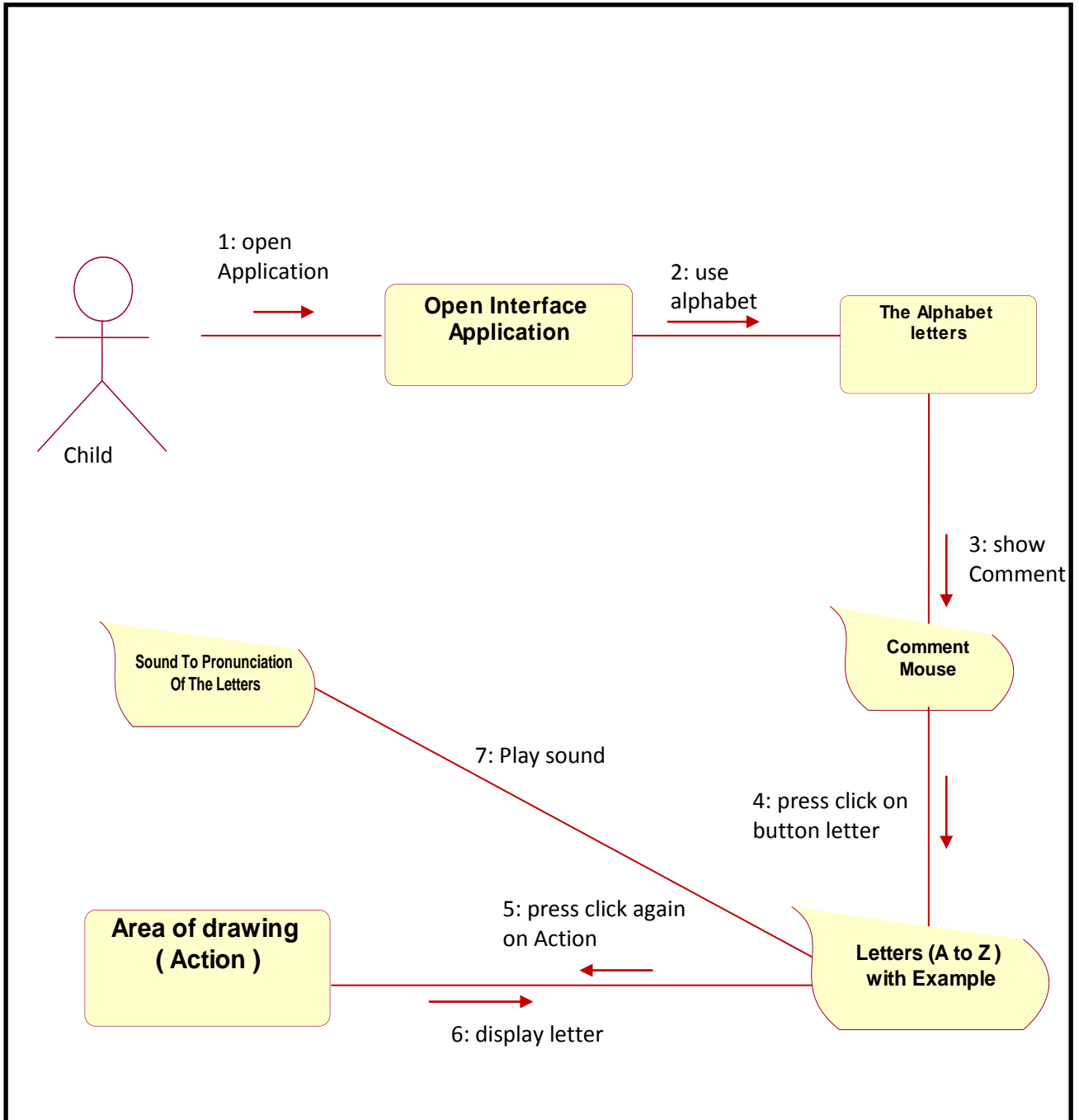


Figure 3.18 Collaboration diagram for alphabet

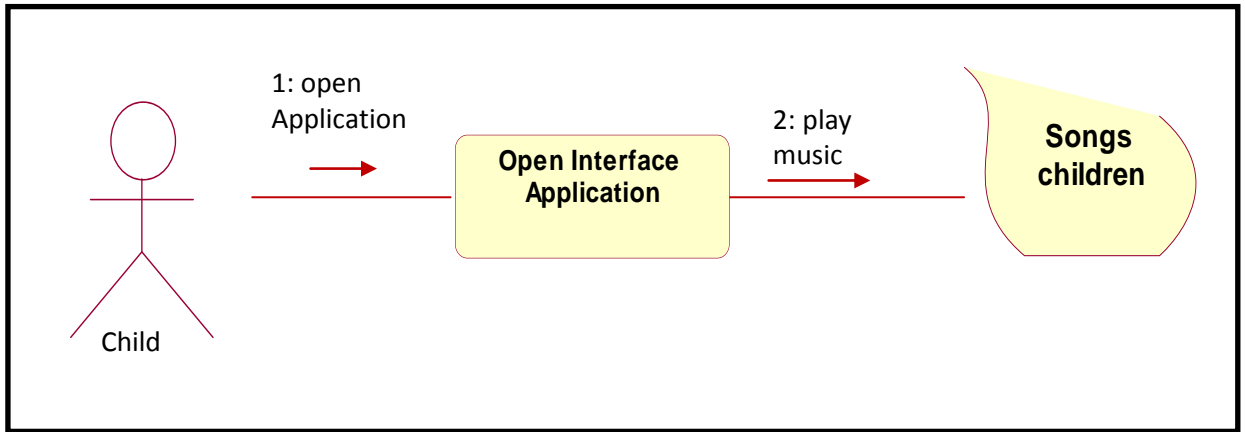


Figure 3.19 Collaboration Diagram for (Children Songs)

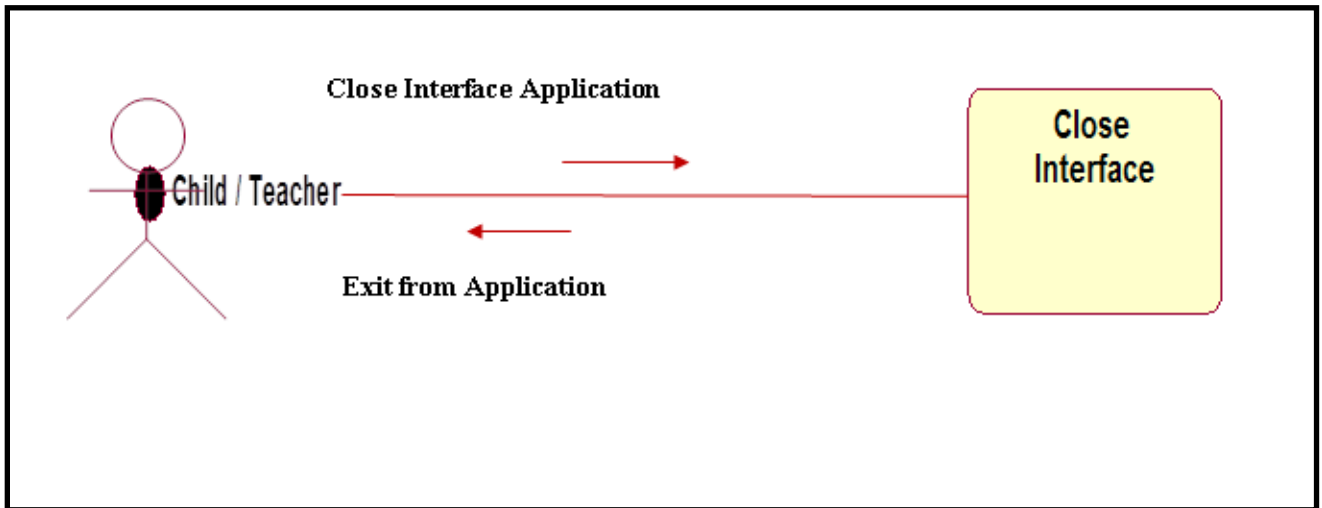


Figure 3.20 Collaboration diagram for closing the *EduPaint*

3.2.7 Class Diagram

According to Martin (2003) class diagrams are the basis for object-oriented analysis and design. The purpose of class diagrams is to represent the classes within a model. In an object-oriented application, classes have attributes (member variables), operations (member functions) and relationships with other classes. The UML class diagram can illustrate all these things fairly easily. In addition, the class diagrams show the classes of the system, their relationships (including inheritance, aggregation and association), and the operations and attributes of classes. In this study, the class diagram for *EduPaint* is illustrated in Figure 21.

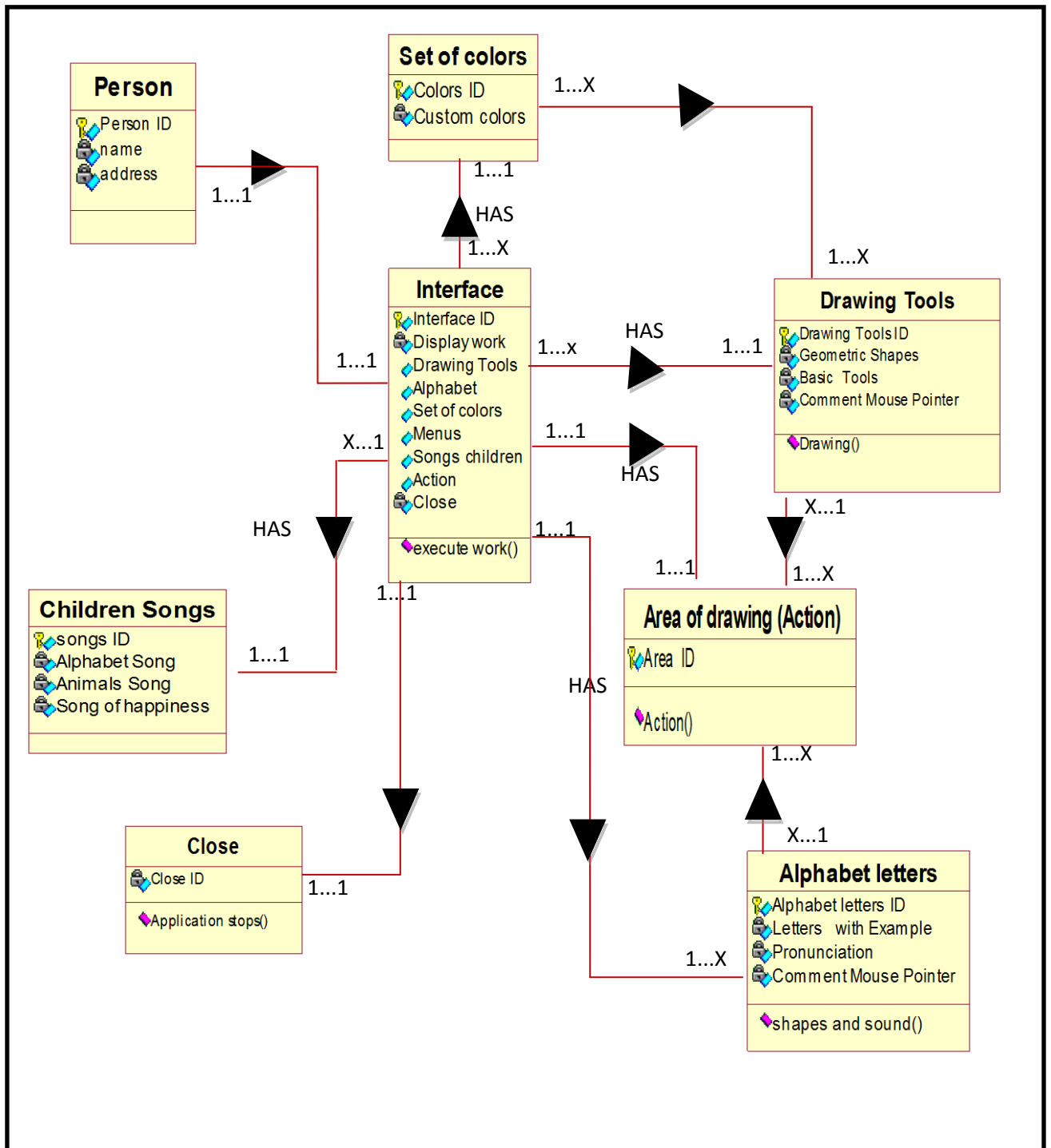


Figure 3.21 Class diagram for *EduPaint*

According to the diagram in Figure 3.21, the class diagram for *EduPaint* consists of five classes. The user class (Child and teacher) contains attributes (name and address). They are associated with interface application that includes attributes (Display work, Drawing Tools, Alphabet, and Close). This classes are associated with three classes: Drawing Tools (with Geometric Shapes, Basic Tools , Set of Colors, Comment Mouse Pointer attributes); The Alphabets (with letters A to Z with examples, pronunciation, tool-tips Mouse Pointer); and the last class is Close (with close *EduPaint*).

3.3 DEVELOPMENT

Having decided on the design of *EduPaint*, they are used as the basis for the development. The design specifications as described in the previous section include the architecture and navigation. In this study, the *EduPaint* is developed using Java as recommended by Laudon and Laudon (2000) and Zhang and Liang (2007). Further, the *EduPaint* and the way it works are described at length in Chapter 4.

3.3.1. Java programming

This project uses Java language, specifically the Java 2D and Java 3D provides powerful, natural, and object-oriented interfaces for graphics modeling and rendering. This Java based graphics text introduces advanced graphic features to a student audience mostly trained in the Java language.

Its accessible approach and in-depth coverage features the high-level Java 2D and Java 3D APIs—offering an elegant and easy-to-understand presentation of 2D and 3D graphics without compromising the fundamentals of the subject (Zhang, H. and Y. D. Liang (2007)).

3.4 Evaluation

The *EduPaint* has been evaluated through user evaluation. It involved children and teachers in pre-schools in their natural setting. It was carried out to ensure that it is working correctly and efficiently in regards to the functionality. Besides, the usefulness, effectiveness, entertainment value, and ease of use were also tested. And the results will be checked by collecting the questionnaires and analyzing them using the Statistical Package for Social Sciences (SPSS) software, to get clear performance. Therefore the testing process provides feedback to the development process.

3.5 Conclusion

Conclusion is the final stage in this study. The results are consolidated and lead to the future works that may unify with this application to implement the overall in prototype.

3.6 Summary

This chapter elaborates the activities involved in carrying out this study. There are three stages involve from start to finish, in which each stage is described. In detail, the problem has been explained in Chapter 1. The design stage is described in detail in this chapter. The development the *EduPaint* itself is described in Chapter 4.

CHAPTER FOUR

EDUCATIONAL PAINTER PROTOTYPE FOR PRESCHOOL CHILDREN

This chapter describes about the *EduPaint*. All tools are explained as well as the steps to use them. This study describes the *EduPaint* in tables, as recommended by Adrien, Nicolas, and Damien (2004-2005), because it supports mental efforts in associating the descriptions with the element being described.

Based on interviews with teachers of kindergarten and by reading some kids' articles and books, to determine the basic requirements to learn drawing and alphabets that should be incorporated in *EduPaint*, are as follows:

4.1 Buttons Requirements

The main interface buttons should be simple, consistent and intuitive. Through the use of the large buttons with an example image inside each button that allow the user (Children) to discrimination and selection of the selected button for drawing tools, and there is extra buttons for exit from the application, also when the mouse pointer rolls over a button, the mouse pointer will show a tool-tip describing about the function of the button.

4.2 Sound Requirements

Sounds are important elements in multimedia application, and must be clear. Therefore all buttons inside the *EduPaint* include audio used to enhance the effectiveness of the program.

4.3 Educational Requirements

4.3.1 Alphabet Letters

This section (Alphabet Letters) should be contains a various set of forms for letters (from A to Z), in which there is an example for each letter. Objects like animals, fruits, and others are used. Hence, the children can learn the letters with its sample in the same time. Also, they can practice drawing these shapes of the animals and fruits. In addition to that, every character is provided with its correct pronunciation.

4.3.2 Repeat Pronunciation Letter

After choosing the letter, users can click again on the drawing board to repeat the pronunciation.

4.4 Overview of *EduPaint*

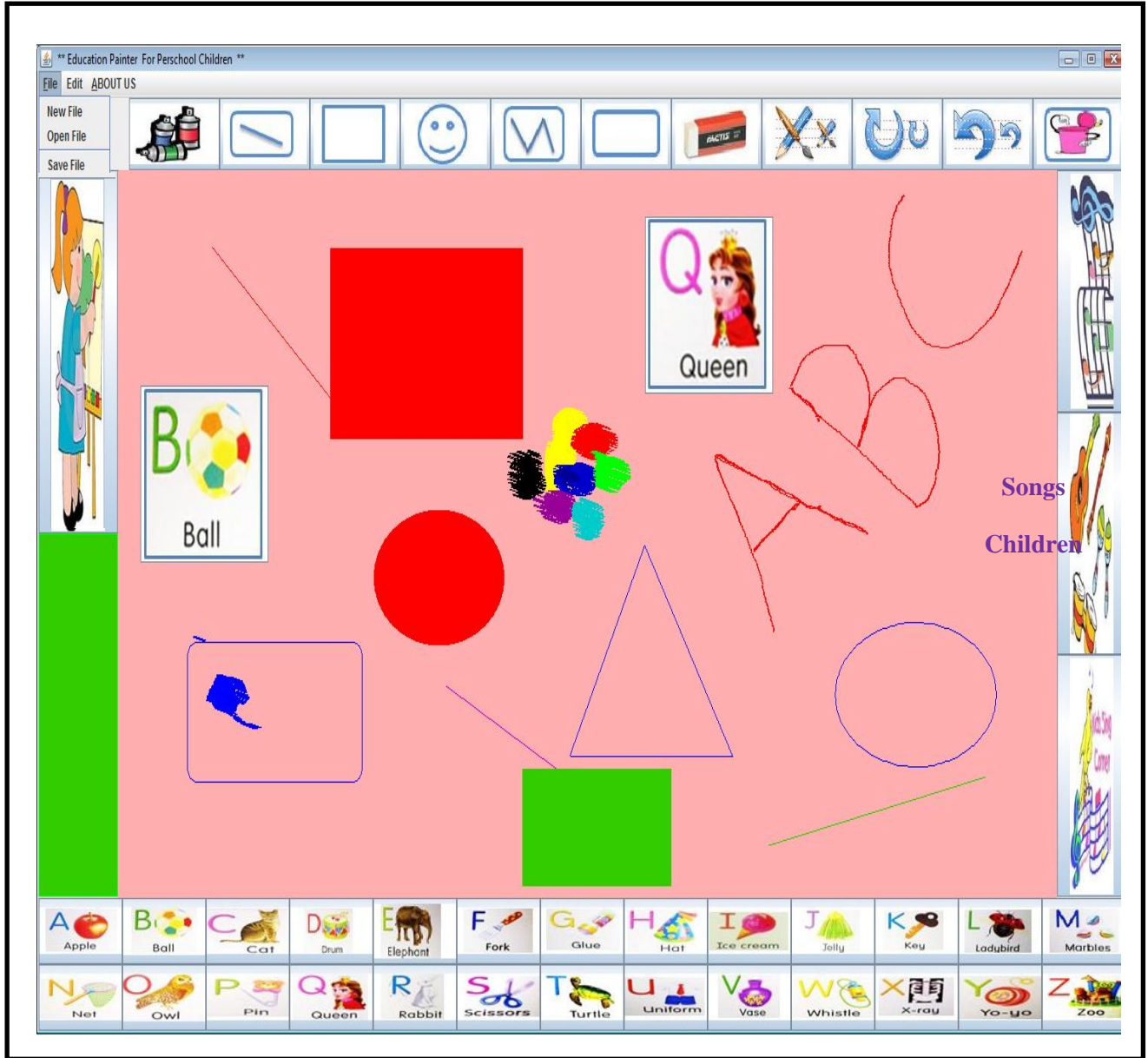


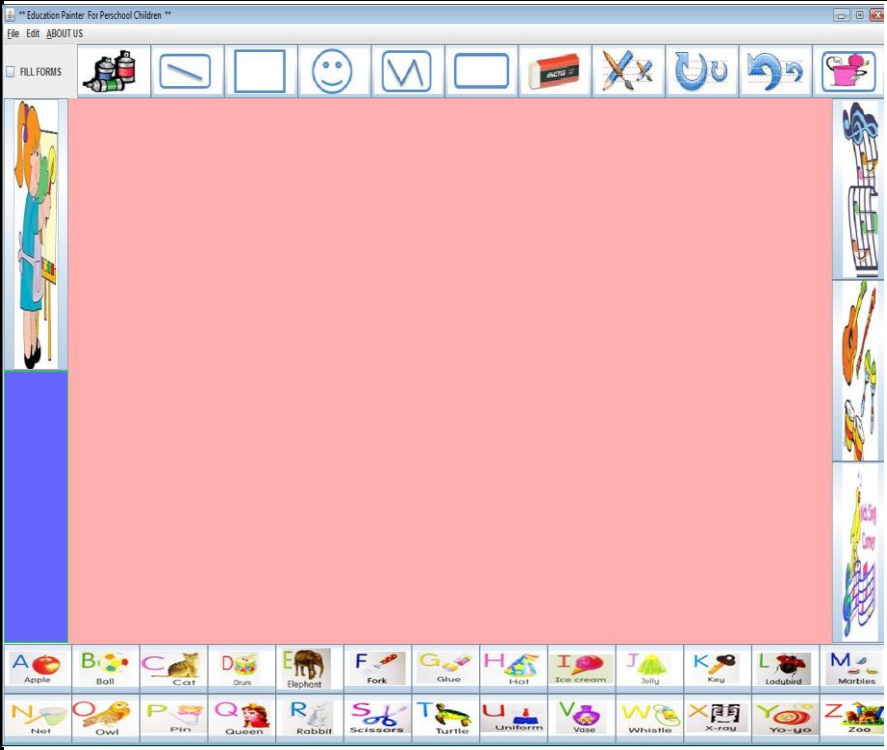




Figure 4.1: The *EduPaint*

EduPaint has various tools that can stimulate children's imagination and mind. As seen in Figure 4.1, the upper bar of the interface includes drawing tools which enables the children to learn letters and draw various forms of animals and fruits. In addition, the children can draw the basic forms of drawing such as squares, rectangles, circles, rectangular, and triangle. Additionally, the users can use airbrush for filling different shapes with colors. Meanwhile, the left toolbar provides a wide range of colors, which helps the users to identify a wide range of colors and discrimination when used for drawing.

Besides, the toolbar at the bottom allows users to learn alphabets. Each alphabet is provided with an example of image. It includes different shapes that indicate the use of the letter in the word. Also, the users are provided with the correct pronunciation for each letter. When they want to listen to music, users can click at the option available on the toolbar on the right. More importantly, users can save the current file or open an existing file the work from the menu.

Further, each tool is described in a table. In particular, Table 4.1 describes about drawing tools, Table 4.2 describes about color setting tools, Table 4.3 describes about learning alphabets tools, Table 4.4 describes about the song tools, Table 4.5 describes about the menu, and Table 4.6 describes about the tool-tips tool.

Table 4.1: Drawing tools

<p>Interface: Drawing Tools</p> <p>Table of objects and actions</p>		<p>Standard page</p>
		<p>Size: 800 x 600. View: full Screen. Button : Sound</p>
		
Imager Object	Name Object	Action Triggered/Description
	Pen Drawing Button	By clicking on this button, users can use the pen for drawing or writing.
	The Eraser Button	By clicking on this button, users can eraser what has been drawn.
	Undo Button	By clicking on this button, users can cancel the previous actions (recent actions).







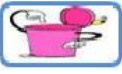

	Undo Button	By clicking on this button, users can cancel the undo action (recent undo).
	Square Button	By clicking on this button, users can draw a square with full sides.
	Circle Button	By clicking on this button, users can draw a circle.
	Rectangle Button	By clicking on this button, users can draw a rectangle with full sides.
	Line Button	By clicking on this button, users can draw a line with different directions.
	Airbrush Button	By clicking on this button, spray can be used to fill shapes.
	Window cleaning Button	By click on this button, users can clean the window
	Fill Forms Button	By clicking on this button, users can fill the different shapes.

Table 4.2: Setting Color Tool

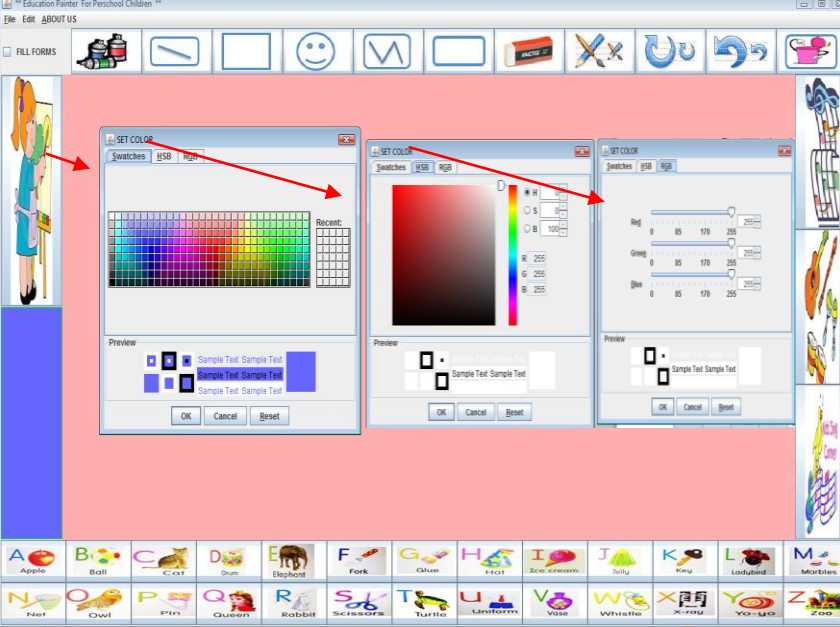
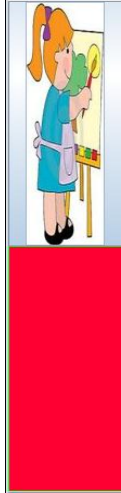


<p>Interface: Setting color</p> <p>Table of objects and actions</p>		<p>Standard page</p>
		<p>Size: Medium. View: Inside interface.</p> 
<p>Set of a large colors</p>		
Imager Object	Name Object	Action Triggered/Description
	<p>Set colors Button</p>	<p>This button has a wide range of colors. In addition, there is a different gradation in the same color. As an example, when users choose blue, this color can be changed into light or dark according to the desired one.</p>
	<p>Type Color</p>	<p>Show the type of color that was chosen.</p>

Table 4.3: Alphabet with pronunciation tool

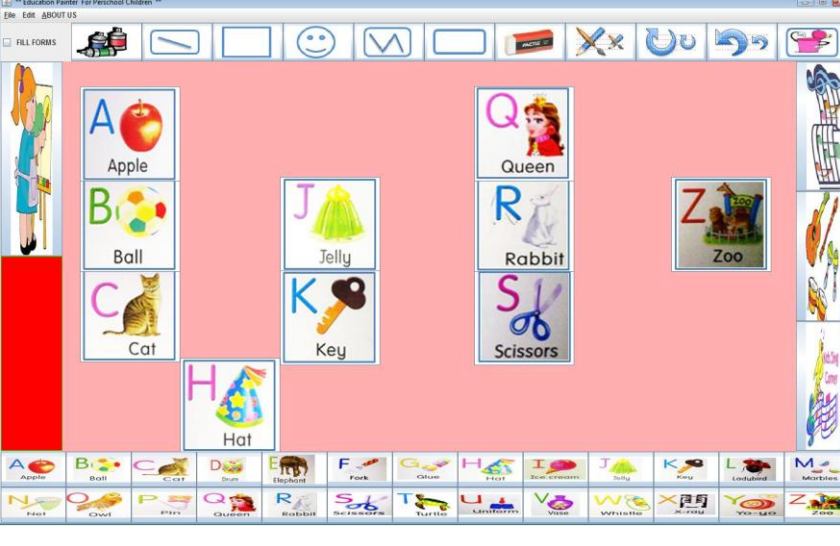


<p>Interface : Alphabet</p> <p style="text-align: center;">Table of objects and actions</p>		<p>Standard page</p>
		<p>Size: Small View: Inside interface. Button : Sound</p>
		
Imager Object	Name Object	Action Triggered/Description
	<p>Alphabet Button</p>	<p>This section contains a various set of forms for letters (from A to Z), in which there is an example for each letter. Objects like animals, fruits, and others are used. Hence, the children can learn the letters with its sample in the same time. Also, they can practice drawing these shapes of the animals and fruits. In addition to that, every character is provided with its correct pronunciation.</p> <p>Repeat Pronunciation Letter After choosing the letter, users can click again on the drawing board to repeat the pronunciation.</p>

Table 4.4: Songs Tool

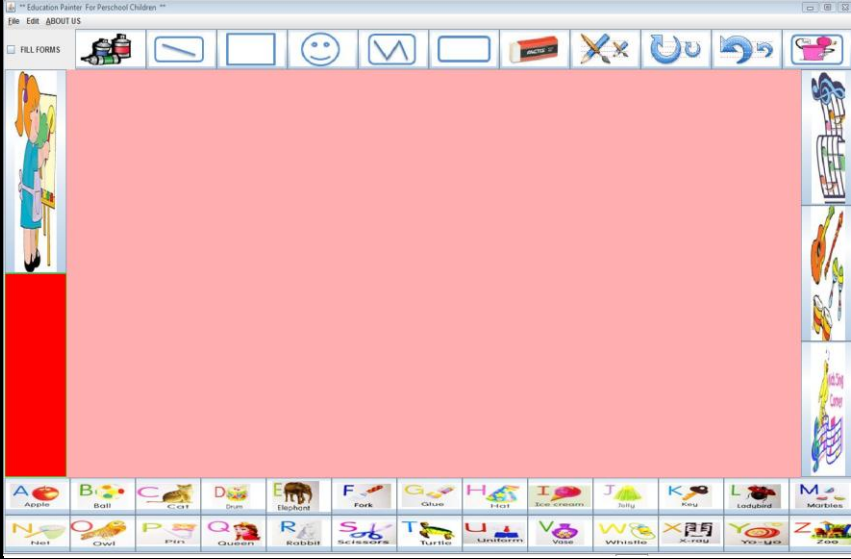


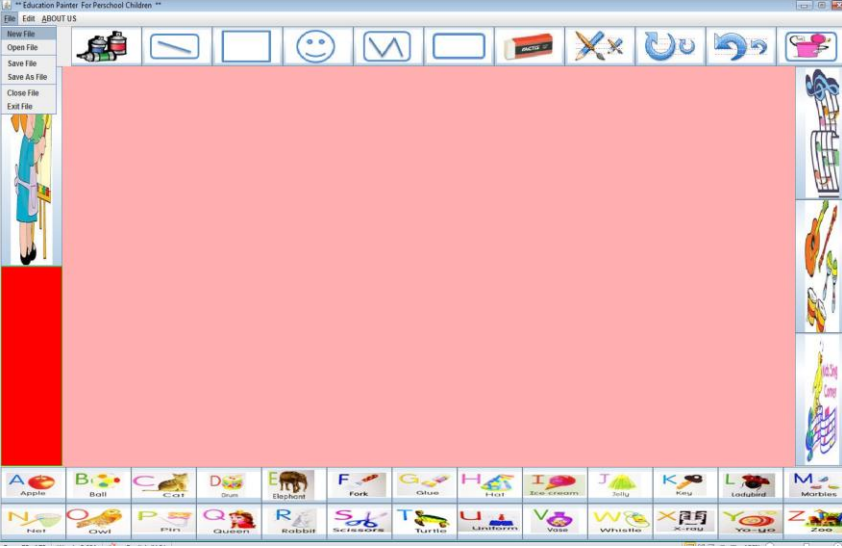
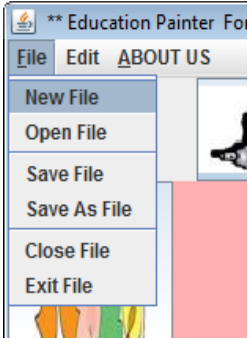
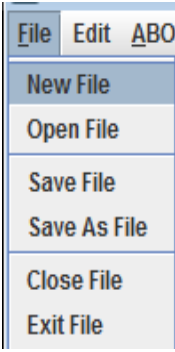
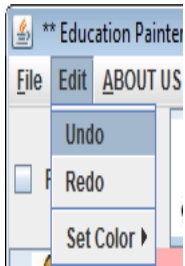
<p>Interface: Children Song</p> <p style="text-align: center;">Table of objects and actions</p>		<p>Standard page</p>
		<p>View: Inside interface. Button : Song</p>
		
Imager Object	Name Object	Action Triggered/Description
	<p>Songs Children Button</p>	<p>This section provides three types of music for the users.</p> <p>The first : Alphabet song</p> <p>The second: Song of happiness for children.</p> <p>The third: Animals song</p>

Table 4.5: Menu Tool

<p>Interface: Menus</p> <p style="text-align: center;">Table of objects and actions</p>		<p>Standard page</p>
		<p>Size : Small View: Inside interface.</p> 
<p>Tools Menu</p>		
Imager Object	Name Object	Action Triggered/Description
	<p>File Menu</p>	<p>This section includes options below:</p> <p>A. <u>File Menu</u></p> <ol style="list-style-type: none"> 1. New File : To create new file for the work 2. Open File: To open a file that was previously stored. 3. Save and Save As: To save the work after finish. 4. Close file: to close file. 5. Exit file: To close application.



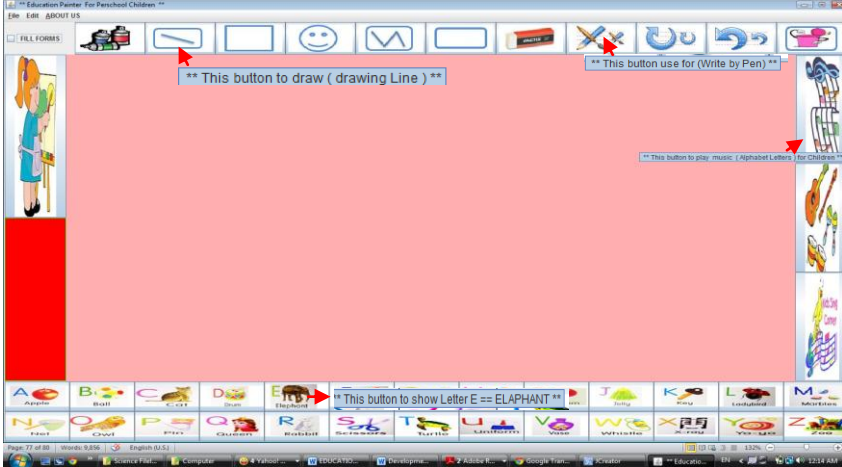
Edit Menu

B. Edit Menu

This menu include (Undo, Redo and set colors) can use this button with work

C. About Us: This menu include information about the designer (Qusay Abboodi Ali)

Table 4.6: Tool-tips Tool

<p>Interface: Tool-tips mouse pointer</p> <p>Table of objects and actions</p>		<p>Standard page</p>
		<p>Size : Small View: Inside interface.</p>
Imager Object	Name Object	Action Triggered/Description
<p>** This button to show Letter E == ELAPHANT **</p> <p>** This button to draw (drawing Line) **</p> <p>** This button use for (Write by Pen) **</p>	<p>Comments mouse pointer</p>	<p>When the mouse pointer rolls over a button, the mouse pointer will show a tool-tip describing about the function of the button.</p>

4.5 Summary

This chapter describes about the *EduPaint*. Each tools is described in a table, so that associating the tool with its' description is easy. From the descriptions, it could be seen that *EduPaint* is able to be utilized for drawing exercise and learning alphabets. Besides, users could listen to music's while performing their tasks.

The *EduPaint* as described in this chapter has been tested with the users. The procedures and results of the testing are discussed at length in Chapter 5.

CHAPTER 5

EVALUATION & RESULTS

Chapter 4 describes about the interface and functions available in *EduPaint*. Through the interface, users can click on any button to perform their tasks. Further, this chapter discusses about the evaluation on the *EduPaint*.

5.1. Evaluation

In order to determine whether the *EduPaint* is useful, this study asked 30 preschool children and 30 preschool teachers to evaluate the prototype. Questionnaires were only given to teachers as preschool children may not be able to answer them appropriately. The questionnaires have been distributed to measure the learnability, perceived usefulness, and perceived ease of use.

The questionnaire consists of four sections which are the general information (demographics) and the evaluation for learnability, usefulness, ease of use, and outcome/future work. In detail, the user evaluation section works as mechanism to collect data on user's opinion regarding to the (*EduPaint*) learnability, usefulness, ease of use and outcome/future use usability aspects. Learnability section measures the capability of learning (*EduPaint*). Two others section, perceived usefulness in which a person believes that using a particular system would enhance his or her job performance and ease of use that measures the degree to which a person believes that using *EduPaint* would be free of effort. Outcome/future use is the degree of user willingness to use *EduPaint* in the future.

5.2. Demographics profile

The demographic analyses are divided into two parts. The first is on children, and it is followed with the second part that describes about the teachers.

5.2.1 Children demographic

In this study, children between 4 and 6 years old were selected as the respondents. In detail, Tables 5.1, 5.2, and 5.3 coupled with Figures 5.1, 5.2, and 5.3 describe about the general information.

Table 5.1 Race (Children)

Race	Frequency	Percent
Malay	25	83.4%
Chinese	1	3.3%
Indian	1	3.3%
others	3	10
Total	30	100 %

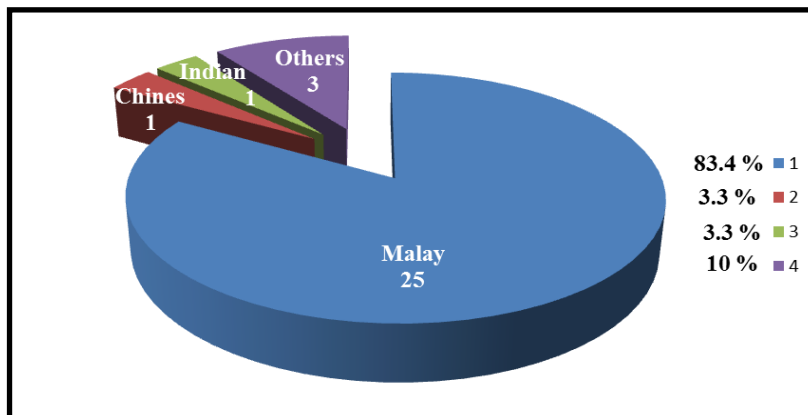


Figure 5.1 Race (Children)

Based on Table 5.1 and Figure 5.1 25 (83.4%) of the children are Malay, 1 (3.3%) is Chinese, 1 (3.3%) is Indian, and 3 (10 %) are others.

Table 5.2: Gender (Children)

Gender	Frequency	Percent
Male	13	43.3%
Female	17	56.7%
Total	30	100 %

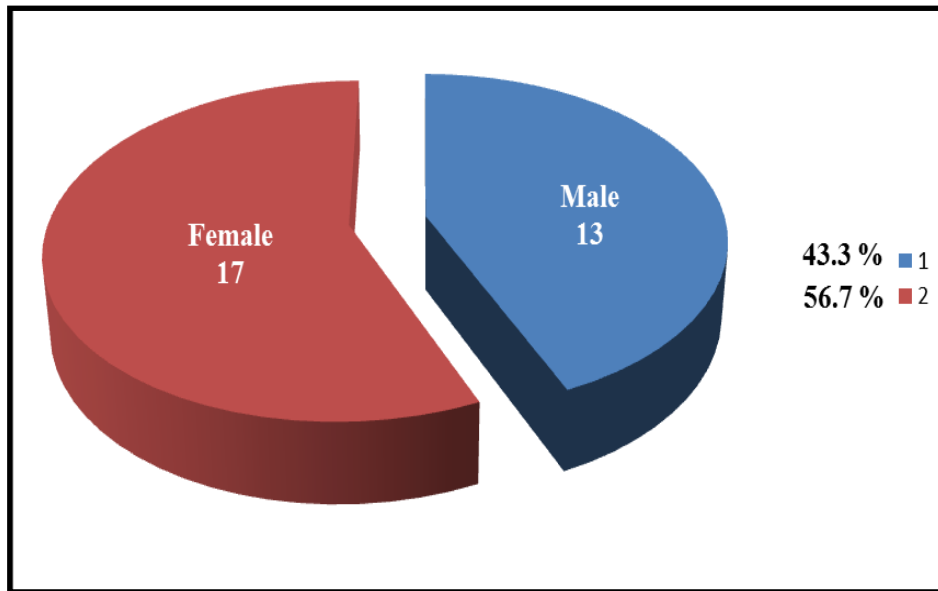


Figure 5.2 Gender (Children)

Table 5.2 and Figure 5.2 show that there are 13 (43.3%) males and 17 (56.7%) females involve in the evaluation

Table 5.3 Ages (Children)

Age	Frequency	Percent %
4	6	20 %
5	6	20 %
6	18	60 %
Total	30	100 %

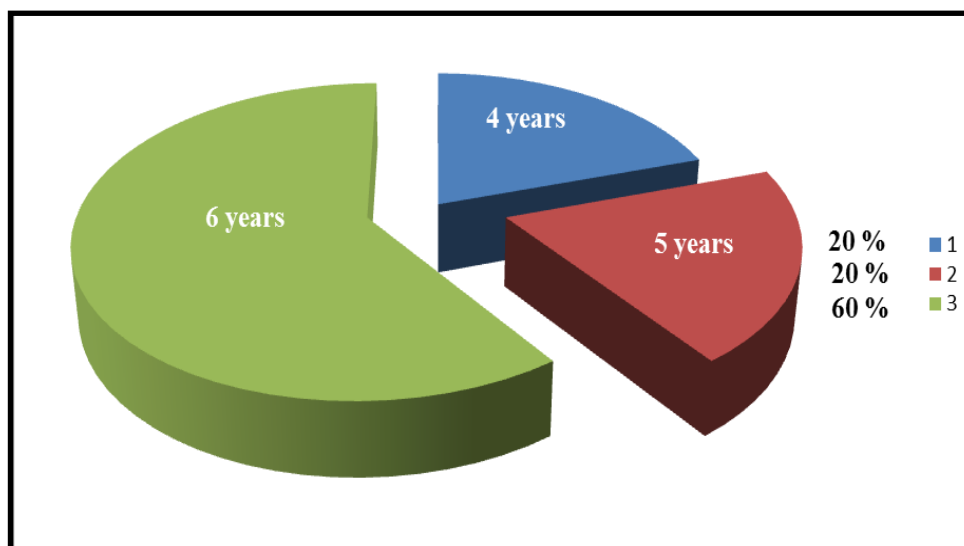


Figure 5.3 Ages (Children)

In terms of age, Table 5.3 supported with Figure 5.3 explain that there are 6 (20 %) 4 years old, 6 (20 %) 5 years old, and 18 (60 %) 6 years old children involve in the evaluation.

Each child was asked whether he/she likes to use the *EduPaint* after having experienced the application.

Their feedbacks were recorded, and are displayed in Table 5.4 and Figure 5.4. From the table and figure, it is seen that obviously all children like to use the *EduPaint* in their learning activity. Overall, we think the results indicate that the participants (Children) agreed that *EduPaint* has good usability.

Table 5.4 Question 1

Do you like to use application Education Painter for Preschool Children?		
Yes	30	100 %
No	0	0 %
Total	30	100 %

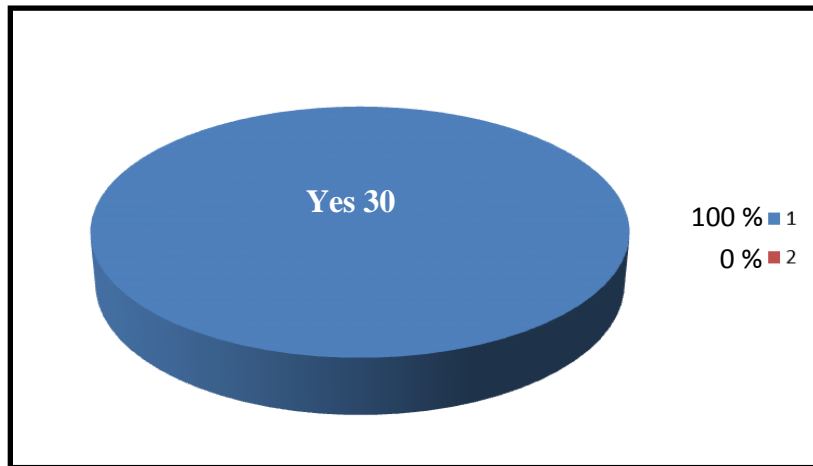


Figure 5.4 Question 1

5.2.2 Teachers and parents demographic

There are altogether 30 teachers involve in the evaluation. Among all of them, 19 (63.4%) are Malay, 0 (0 %) Chinese, 1 (3.3%) Indian, and 10 (33.3 %) are others. Table 5.5 and Figure 5.5 exhibit the figures.

Table 5.5 Race (Teachers and Parents)

Race	Frequency	Percent
Malay	19	63.4%
Chinese	0	0%
Indian	1	3.3%
others	10	33.3
Total	30	100 %

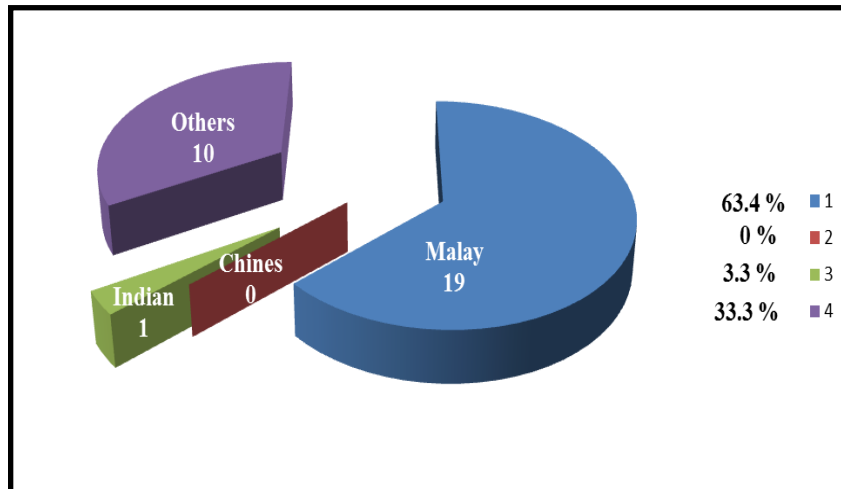


Figure 5.5 Race (Teachers and Parents)

Table 5.6 and Figure 5.6 explains that 11 (36.7%) of the teachers are Male, and 16 (63.3 %) are female. Further Table and Figure 5.7 divide the respondents into teacher and parents categories, in which 19 (63.3%) of them are teachers, and 11 (36.7 %) are parents.

Table 5.6 Gender (Teachers and Parents)

Gender	Frequency	Percent
Male	11	36.7%
Female	19	63.3%
Total	30	100 %

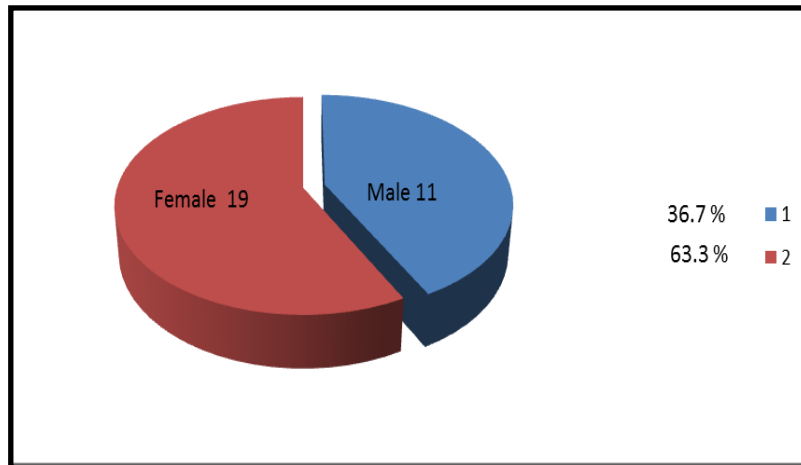


Figure 5.6 Gender (Teachers and Parents)

Table 5.7 Teachers and Parents

Gender	Frequency	Percent
Teachers	19	63.3%
Parents	11	36.7%
Total	30	100 %

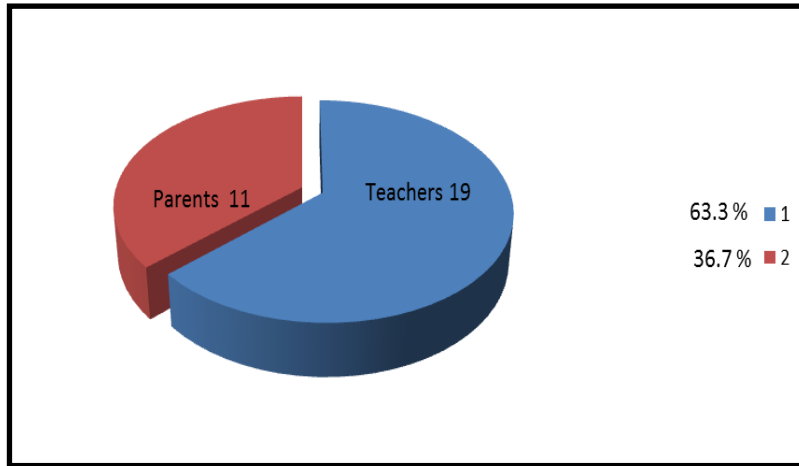


Figure 5.7 Teachers and Parents

Additionally, Table 5.8 and Figure 5.8 show that there were 133 (84.1%) numbers of children for all teachers, and 25 (15.9 %) numbers of children for all parents.

Table 5.8 Total Number Children

Gender	Frequency children	Percent
Teachers	133	84.1%
Parents	25	15.9%
Total	158	100 %

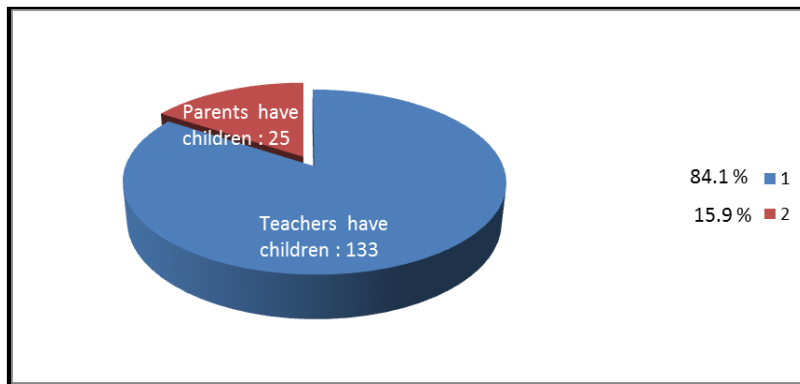


Figure 5.8 Total Number Children

5.3 Usability

This section analyzes the evaluation results in terms of the usability of *EduPaint*. Each of the aspects is described in the following subsection.

5.3.1 Learnability

This section consists of 4 questions for choosing the degree to which a person believes that using this application would be easy to improve their learning ability (Nielsen, 1993; 2006).

Table 5.9 Question 1

It was easy to learn to use Education Painter for Preschool Children?			
Answer	Frequency	Percent	Valid Percent
1 (Strongly Disagree)	0		0
2 (Disagree)	0		0
3 (Neutral)	4	13.4	13.4
4 (Agree)	16	53.3	53.3
5 (Strongly Agree)	10	33.3	33.3
Total	30	100.0	100.0

The first question asks “*It was easy to learn to use Education Painter for Preschool Children?*” The answers are summarized in Table 5.9. It can be seen that almost all respondents agree with the question. This means that respondents find using *EduPaint* is easy.

The feedbacks are summarized in Table 5.9. It is seen that 16 respondents agree by (53.3%) with the statement. And 10 respondents seen strong agree by (33.3%). The rest (4 respondents (13.4%)) are neutral. From the results, this study deduces that respondents agree with the statement, which means the functions in *EduPaint* helps the respondents in their tasks.

Table 5.10 Question 2

Information provided by Education Painter for Preschool Children is easy to understand?			
Answer	Frequency	Percent	Valid Percent
1 (Strongly Disagree)	0		0
2 (Disagree)	0		0
3 (Neutral)	0	0	0
4 (Agree)	17	56.7	56.7
5 (Strongly Agree)	13	43.3	43.3
Total	30	100.0	100.0

The answers to question two (*Information provided by Education Painter for Preschool Children is easy to understand?*) are summarized in Table 5.10. It explains that all respondents agree with the statement, which implies that the information in the *EduPaint* is easy to be understood by the users. Where It is seen that 17 respondents agree by (56.7%) with the statement. The rest (13 respondents (43.3%)) are strong agree. From the results, which implies that the information in the *EduPaint* is easy to be understood by the users.

Meanwhile Question 3 asks whether *the “ function provided in Education Painter for Preschool Children helped me in teaching process”*. The feedbacks are summarized in Table 5.11. It is seen that 20 respondents agree with the statement. The rest (10 respondents (33.3%)) are neutral. From the results, we conclude that respondents agree

with the statement, which means the functions in *EduPaint* helps the respondents in their tasks.

Table 5.11 Question 3

The function provided in Education Painter for Preschool Children helped me in teaching process.			
Answer	Frequency	Percent	Valid Percent
1 (Strongly Disagree)	0		0
2 (Disagree)	0		0
3 (Neutral)	10	33.3	33.3
4 (Agree)	16	53.4	53.4
5 (Strongly Agree)	4	13.3	13.3
Total	30	100.0	100.0

When asked “*The ordering of information is logical*”, the respondents answer as those summarized in Table 5.12. From the table, it is seen that 11 respondents (36.6%) are neutral, while the highest number of respondents of Teachers and Parents said agree by (46.7%) and (16.7%) said that they strongly agree the ordering of information is logical. Hence we think, this study deduces that respondents agree with the statements. This explains that the order of information in *EduPaint* is logical.

Table 5.12 Question 4

The ordering of information is logical.			
Answer	Frequency	Percent	Valid Percent
1 (Strongly Disagree)	0		0
2 (Disagree)	0		0
3 (Neutral)	11	36.6	36.6
4 (Agree)	14	46.7	46.7
5 (Strongly Agree)	5	16.7	16.7
Total	30	100.0	100.0

5.3.2 Usefulness

The usefulness aspect measures the degree to which a person believes that using *EduPaint* would enhance his or her job performance (Davis, 1993; Dennis, 2008).

Regarding the usefulness, the respondents were first asked whether “*Using EduPaint for Preschool Children would enhance my effectiveness in teaching the children*”. The answers to this question are summarized Table 5.13. It is seen that most respondents agree with the statement. Although there is one respondent disagree, the percentage (3.3%) is too small to influence the result. This means that the *EduPaint* could enhance teaching effectiveness among the teachers at preschools.

Table 5.13 Question 5

Using Education Painter for Preschool Children would enhance my effectiveness in teaching the children.			
Answer	Frequency	Percent	Valid Percent
1 (Strongly Disagree)	0	0	0
2 (Disagree)	1	3.3	3.3
3 (Neutral)	11	36.7	36.7
4 (Agree)	11	36.7	36.7
5 (Strongly Agree)	7	23.3	23.3
Total	30	100.0	100.0

The answers to question six “*Using EduPaint for Preschool Children would make it easier to teach*” are summarized in Table 5.14. It shows that all respondents agree with the statement. This strongly means that the *EduPaint* makes teaching easier.

Therefore the feedbacks are summarized in Table 5.14. It is seen that 11 respondents (teachers and parents) agree by (36.7%) with the statement. and 7 of respondents seen strong agree by (33.3%) where it easier to teach. The rest (11 respondents (136.7%)) are neutral. It can be seen that only one of the respondents disagree, because we think he is not teacher. So, from the results, this study deduces that respondents agree with the statement, which means the functions in *EduPaint* helps the respondents in their tasks.

Table 5.14 Question 6

Using Education Painter for Preschool Children would make it easier to teach.			
Answer	Frequency	Percent	Valid Percent
1 (Strongly Disagree)	0	0	0
2 (Disagree)	0	0	0
3 (Neutral)	0	0	0
4 (Agree)	17	56.7	56.7
5 (Strongly Agree)	13	43.3	43.3
Total	30	100.0	100.0

Then, it can be noted from the answers to question seven “*I would find EduPaint for Preschool Children useful in my job*”, as summarized in Table 5.15, that all respondents agree with the statement. Where it is seen that 17 respondents of teacher and parents they said agree by (56.7%) useful for them in their job. And 8 of respondents they seen strong agree by (26.7%). The rest (5 respondents (16.6%)) are neutral. This means that the respondents find that *EduPaint* is useful in assisting them in their job.

Table 5.15 Question 7

I would find Education Painter for Preschool Children useful in my job.			
Answer	Frequency	Percent	Valid Percent
1 (Strongly Disagree)	0	0	0
2 (Disagree)	0	0	0
3 (Neutral)	5	16.6	16.6
4 (Agree)	17	56.7	56.7
5 (Strongly Agree)	8	26.7	26.7
Total	30	100.0	100.0

5.3.3 Ease of use

This section include discuss the *EduPaint* in terms of ease of use, in which it refers to the degree to which a person is willing to use this application believes that using this application would be free of effort (Davis, 1989).

The respondents were first asked “*Learning to operate Education Painter for Preschool Children would be easy for me*”. Their answers are summarized in Table 5.16. It is seen that 14 of respondents (teachers and Parents) they said strong agree by (46.7) it is easy to operate the *EduPaint*. And 11 respondents of teacher and parents they said agree by (36.7%) with the statement. The rest (5 respondents (16.6%)) are neutral. It is seen that all respondents agree with the statement. This explains that respondents feel it is easy to operate the *EduPaint*.

Table 5.16 Question 8

Learning to operate Education Painter for Preschool Children would be easy for me.			
Answer	Frequency	Percent	Valid Percent
1 (Strongly Disagree)	0	0	0
2 (Disagree)	0	0	0
3 (Neutral)	5	16.6	16.6
4 (Agree)	11	36.7	36.7
5 (Strongly Agree)	14	46.7	46.7
Total	30	100.0	100.0

Then, they were asked “*I would find it easy to get EduPaint for Preschool Children to do what I want it to do*”. Table 5.17 summarizes their answers. It can be seen that only one (3.3%) respondent disagrees with the statement, because we believe that he is not teachers. The rest agree by (56.7) and strong agree by (3.3) with the statement. This implies that the respondents find that *EduPaint* supports their intention well.

Table 5.17 Question 9

I would find it easy to get Education Painter for Preschool Children to do what I want it to do.			
Answer	Frequency	Percent	Valid Percent
1 (Strongly Disagree)			0
2 (Disagree)	1	3.3	3.3
3 (Neutral)	11	36.7	36.7
4 (Agree)	17	56.7	56.7
5 (Strongly Agree)	1	3.3	3.3
Total	30	100.0	100.0

The answers to question ten “*My interaction with Education Painter for Preschool Children would be clear and understandable*” are summarized in Table 5.18. It can be seen that most respondents agree with the statement with 23.3 % of them neutral. This means that the respondents of teachers and parents agree by (63.7) and strong agree by (13.3) with the statement. This explains that the respondents understand well about the interaction in the *EduPaint*.

Table 5.18 Question 10

My interaction with Education Painter for Preschool Children would be clear and understandable.			
Answer	Frequency	Percent	Valid Percent
1 (Strongly Disagree)	0	0	0
2 (Disagree)	0	0	0
3 (Neutral)	7	23.3	23.3
4 (Agree)	19	63.7	63.7
5 (Strongly Agree)	4	13.3	13.3
Total	30	100.0	100.0

Then, question eleven “*I would find Education Painter for Preschool Children to be flexible to interact with*” was asked. The answers are summarized in Table 5.19. It is seen that 13 respondents agree by (43.4%) with the statement. And 7 respondents seen strong agree by (23.3%). The rest (10 respondents (33.3%)) are neutral. From the results, we can conclude that the most respondents agree with the statement, which means the *EduPaint* is flexible.

Table 5.19 Question 11

I would find Education Painter for Preschool Children to be flexible to interact with.			
Answer	Frequency	Percent	Valid Percent
1 (Strongly Disagree)	0	0	0
2 (Disagree)	0	0	0
3 (Neutral)	10	33.3	33.3
4 (Agree)	13	43.4	43.4
5 (Strongly Agree)	7	23.3	23.3
Total	30	100.0	100.0

Question Twelfth asks “*It would be easy for me to become skillful at using EduPaint for Preschool Children*”. Based on the answers that are summarized in Table 5.20, It is seen that 14 respondents teachers and parents they said agree by (46.7%) with the statement. and 3 of respondents seen strong agree by (10 %). The rest (13 respondents (43.3%)) are neutral. So, all respondents agree with the statements. This means that the *EduPaint* is easy to be learned.

Table 5.20 Question 12

It would be easy for me to become skillful at using Education Painter for Preschool Children.			
Answer	Frequency	Percent	Valid Percent
1 (Strongly Disagree)	0	0	0
2 (Disagree)	0	0	0
3 (Neutral)	13	43.3	43.3
4 (Agree)	14	46.7	46.7
5 (Strongly Agree)	3	10	10
Total	30	100.0	100.0

Finally, question thirteen “*I would find Education Painter for Preschool Children easy to use*” was asked. Based on the results summarized in Table 5.21, It is seen that 16 respondents (teachers and parents) agree by (53.4%) with the statement. and 13 of respondents seen strong agree by (43.3%) where it easier to teach. And there is only one of respondents (3.3%) is neutral. Therefore, we conclude that there was no respondent disagrees with the statement. This means that the *EduPaint* is easy to be used.

Table 5.21 Question 13

I would find Education Painter for Preschool Children easy to use.			
Answer	Frequency	Percent	Valid Percent
1 (Strongly Disagree)	0	0	0
2 (Disagree)	0	0	0
3 (Neutral)	1	3.3	3.3
4 (Agree)	16	53.4	53.4
5 (Strongly Agree)	13	43.3	43.3
Total	30	100.0	100.0

5.4 Summary

This chapter provides the results of the evaluation. The demographics profiles starts the discussions, followed the results in terms of usability aspect, which covers learnability, ease of use, and usefulness.

Based on the results, the respondents in the evaluation vary from different races, and age. Besides, they are balanced in terms of gender. This makes their feedbacks free from any bias in terms of age and gender. From the previous section, this study deduces that the learning curve for *EduPaint* is short, it easy to learn, and it is also useful. Further discussions are available in Chapter 6.

CHAPTER SIX

CONCLUSION

This chapter discusses the limitations of this study and the recommendations for future works. As stated in Chapter 1, the objectives of this study are to propose a application that help children to learn drawing and alphabet letters which is called Education Painter For Preschool Children. Through a series of activities as elaborated in Chapter 3, the objectives have been achieved, in which the *EduPaint* is described at length in Chapter 4, Through study of many applications that designed for the education the child from early age, in addition to study the requirements to design *EduPaint* which be appropriate to the children in terms of ease of use and interactivity with the application (*EduPaint*). Further, it has been tested, and the results are outlined in Chapter 5.

6.1 Problems and limitations

This study faced difficulties in testing the *EduPaint*. This is due to the lack of the use of computers in kindergartens. Also, kindergartens which do not have any computer in their operation will not get the benefit of *EduPaint*.

6.2 Recommendations for future work

Every study has problems and limitations (Xiao & Dasgupta, 2002), and this study is no exception. With reference to the results of the user evaluation on the *EduPaint*, it has

achieved the objectives. Even though this study has made a lot of effort to develop a perfect prototype of *EduPaint* for children, still there are few recommendations and suggestions that need to be considered for the future development. In conjunction, the list below could be considered:

- The scope of this research is limited for children. Thus, further developments have to be made to cover other ages of people.
- The prototype focuses to learn alphabets with sound (pronunciation) to help children to be able to read and write. Thus, the next step is to help children understand the meaning of the words and sentences in English and Arabic especially when they read Qur'an.
- This study focuses only on the basic tools for the drawing. To make the *EduPaint* more usable, more modern tools for drawing should be incorporated.

6.3 Conclusion

As mentioned in the first chapter, the aim of this study is to design an application that enables children to draw with drawing tools. At the same time they could learn alphabets, and listen to correct pronunciations.

In response to that, Chapter 3 elaborated on the design of the *EduPaint* in detail. Further, Chapter 4 describes about the *EduPaint*. Next, Chapter 5 explains about the evaluation and the results.

Based on the evaluation results, it was found that the *EduPaint* is useful in serving the teachers purposes in the kindergartens. Besides, the learning curve to get familiar with the *EduPaint* is short, which means one can learn very quickly to be good at using *EduPaint*. Also, the *EduPaint* is very easy to use.

6.4. Summary

As an overall, this project has achieved the project main objective which is to develop an *EduPaint* for preschool children. Several suggestions for the future enhancement of this prototype system also have been recommended for the future development of this project.

REFERENCES

- Adrien, C., Nicolas, L., & Damien, M. (2004-2005). *CD-ROM interactif pour découvrir lerugby*. Unpublished Projet de Multimédia, Université de Marne-la-Vallée, Cité Descartes.
- Almekhlafi, A. G. (2006). The Effect of Computer Assisted Language Learning (CALL) on United Arab Emirates English as a Foreign Language (EFL) School Students. *Journal of Interactive Learning Research*, 17(2), 21.
- Australian Flexible Learning Framework. (2009), Designing and Implementing elearning. Retrieved January 31, from <http://designing.flexiblelearning.net.au/index.htm>
- A Brief Guide to Interaction Multimedia and the Study of the United States, Retrieved January 15, 2009, from www.georgetown.edu/faculty/bassr/multimedia.html
- Babbitt, B. C. (1993). Hypermedia: Making the Mathematics Connection. *Journal of Intervention in School and Clinic*, 28(5), 294-301.
- Bacon, J., Martin, R., & John, R. (1999). Director 7 and Lingo Bible: IDG Books Worldwide, Inc.
- Bass, R. (2003). A brief guide to interactive multimedia and the study of the United States. Retrieved November, 24.
- Binosi, D. (2004). "JaxoDraw: A graphical user interface for drawing Feynman diagrams* 1." *Computer physics communications* 161(1-2): 76-86.

- Carr, A. A., & Bromley, H. (1997). Technology and Change: Preservice Perceptions on Agency. *Journal of Teaching Education*, 8(2), 15-22.
- Castles, A., & Coltheart, M. (2004). Is there a causal link from phonological awareness to success in learning to read? *Cognition*, 91(1), 77-111.
- Chen, J. Q. and C. Chang (2006). "Using computers in early childhood classrooms." *Journal of Early Childhood Research* 4(2): 169.
- Chera, P., & Wood, C. (2003). Animated multimedia talking books can promote phonological awareness in children beginning to read. *Learning and Instruction*, 13, 33-52.
- Chung, L., & do Prado Leite, J. (2009). On non-functional requirements in software engineering. *Conceptual modeling: Foundations and applications*, 363-379.
- Chung, L., & do Prado Leite, J. (2009). On non-functional requirements in software engineering. *Conceptual modeling: Foundations and applications*, 363-379.
- CLEMENTS, D. H. (2002). "Computers in early childhood mathematics." *Contemporary issues in early childhood* 3(2): 160-181.
- Clements, Douglas H., & Sarama, Julie. (2003). Young children and technology: What does the research say? *Young Children*, 58(6), 34-40.
- Coakes, S. (2005). *SPSS Version 12 for Windows: Analysis Without Anguish*. Sydney: John Wiley & Sons Australia.

Cordes, C., & Miller, E. (2000). Foolâ€™s Gold. *A critical look at computers in hildhood*.
College Park, Maryland: Alliance for childhood.

Daintith, J. (2009). "System design", A Dictionary of Computing. Retrieved May 1, 2011,
from <http://www.encyclopedia.com/doc/1O11-systemdesign.html>.

Dalli, C., Cherrington, S., Oldridge, L., & Green, V. (2009). Evaluation of the Early
Childhood Education Information and Communication Technology Professional
Learning Programme.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of
information technology. *Journal of Human-Computer Interaction*, 3(13), 319-340.

Davis, F. D. (1993). User acceptance of information technology: system characteristics,
user perceptions and behavioral impacts. *Journal of International Journal of Man-
Machine Studies*, 38(3), 475-487.

Deitel, P. J. and H. M. Deitel (2011). Java for programmers, Prentice Hall.

Dennis, A., Wixom, B. H., & Tegarden, D. (2009). *Systems Analysis and Design with
UML Version 2*. New Jersey: WILEY.

Dennis, S. (2008). How to design a questionnaire / survey, from
[http://www.nswphc.unsw.edu.au/pdf/ShortCourseResMetJul06/PPTs/Questionairedesign
_SarahDennis_HudsonBirden.pdf](http://www.nswphc.unsw.edu.au/pdf/ShortCourseResMetJul06/PPTs/Questionairedesign_SarahDennis_HudsonBirden.pdf).

Fallahkhair, S., Masthoff, J., & Pemberton, L. (2004). *Learning languages from interactive television: Language learners reflect on techniques and technologies*. Paper presented at the World Conference on Educational Multimedia, Hypermedia & Telecommunications EdMedia.

Fallahkhair, S., Masthoff, J., & Pemberton, L. (2004). *Learning languages from interactive television: Language learners reflect on techniques and technologies*. Paper presented at the World Conference on Educational Multimedia, Hypermedia & Telecommunications EdMedia.

Faryadi, Q. (2006). *Bye, Bye Verbal-Only Method of Learning: Welcome Interactive Multimedia*. UiTM Malaysia.

Feng-ping, Y., F. Chun-hua, et al. (2008). "Design of a software of drawing monitoring graphics based on Java and SVG [J]." Relay.

Fetaji, B., & Fetaji, M. (2007). *Evaluation of e-Learning Content and Analyses of Learning Process*. Paper presented at the International Conference on E-learning, USA.

Field, A. P. (2009). *Discovering Statistics Using Spss*. Singapore: SAGE Publications Asia-pacific Pte Ltd.

Freeman, N. K. and Somerindyke, J. (2001) 'Social Play at the Computer: Preschoolers Scaffold and Support Peers' Computer Competence'. *Information Technology in Childhood Education Annual*: 203–13.

Frear, V., & Hirschbuhl, J. J. (1999). Does interactive multimedia promote achievement and higher level thinking skills for today's science students? *British Journal of Educational Technology*, 30(4), 323-329.

Ghezzi, C., & Tamburrelli, G. (2009). *Reasoning on non-functional requirements for integrated services*. Paper presented at the Requirements Engineering Conference, 2009. RE'09. 17th IEEE International.

Goswami, U. (1999). Causal connections in beginning reading: The importance of rhyme. *Journal of Research in Reading*, 22(3), 217-240.

Hanayanti Hafit (2009), Universiti Tun Hussein Onn Malaysia, Johor, Malaysia from, www.designingforchildren.net/papers/h-hafit-designingforchildren.pdf

Haugland, Susan W. (2000b). What role should technology play in young children's learning? Part 2. Early childhood classrooms for the 21st century. Using computers to maximize learning. *Young Children*, 55(1), 12-18. EJ 603 939.

Hecht, S. A., & Close, L. (2002). Emergent literacy skills and training time uniquely predict variability in responses to phonemic awareness training in disadvantaged kindergartners. *Journal of Experimental Child Psychology*, 82, 93–115

Heft, T. M. and Swaminathan, S. (2002) 'The effects of computers on the social behavior of preschoolers'. *Journal of Research in Childhood Education* 16(2): 162–74.

Ioannou, A., Brown, S., Gehlbach, H., Boyer, M., Niv-Solomon, A., Janik, L., et al. (2007). *Incorporating Multimedia in Social Studies Instruction: Does it Improve Students' Performance, Interest, and Instructional Effectiveness Attitude?* Paper presented at the Educational Multimedia, Hypermedia and Telecommunications, Vancouver, Canada.

Jiang, G., Lan, J., & Zhuang, X. (2001). *Distance learning technologies and an interactive multimedia educational system.* Paper presented at the Advanced Learning Technologies, 2001. Proceedings. IEEE International Conference on.

Johnson, G. M. and N. Zaparyniuk (2007). *Online behavior and cognitive development.* Proceeding of the World Conference on Educational Multimedia, Hypermedia and Telecommunications.

Jones, A. J. (2003). *Infusing ICT use within the early years of elementary education.* Proceedings of the international federation for information processing working group 3.5 open conference on Young children and learning technologies-Volume 34, Australian Computer Society, Inc.

Kendrick, M. and R. McKay (2004). "Drawings as an alternative way of understanding young children's constructions of literacy." *Journal of Early Childhood Literacy* 4(1): 109.

Klawonn, F. (2008). *Introduction to computer graphics: using Java 2D and 3D*, Springer-Verlag New York Inc.

Laudon, K. C., & Laudon, J. P. (2000). *Management Information Systems: Organization and Technology in the Networked Enterprise*: Prentice Hall.

Liang, Y. D. (2009). *Introduction to Java programming: Comprehensive version*, Prentice Hall.

Liu, M. (2005). *How Pre-kindergarten Children Use the Interactive Multimedia Technology: Implications for Multimedia Software Design* (Research/Technical). Austin: University of Texas at Austin.

Lynch, S. A. and L. Warner (2004). "Computer use in preschools: directors' reports of the state of the practice." *Early Childhood Research and Practice* 6(2).

Lynch, S. A. and L. Warner (2004). "Computer use in preschools: directors' reports of the state of the practice." *Early Childhood Research and Practice* 6(2).

Mark, Overmars. (2009). Drawing for Children drawing application. Available at <http://drawing.gamemaker.nl> [Accessed 7 August 2009]

Mayer, R. E. (2002). Multimedia learning. *Psychology of Learning and Motivation*, 41, 85-139.

McGriff, S. J. (2000). instructional system design: Using the ADDIE Model. Retrieved January 29, 2009, from <http://www.seas.gwu.edu/>

Midmarket CIO (2005). *Definitions Rational Rose*, Retrieved May 2, 2011, from <http://searchciomidmarket.techtarget.com/definition/Rational-Rose>.

- Mioduser, D., Tur-Kaspa, H., & Leitner, I. (2000). The learning value of computer-based instruction of early reading skills. *Journal of Computer-Assisted Learning*, 16, 54–65
- Mitchell, M. J., & Fox, B. J. (2001). The effects of computer software for developing awareness in low-progress readers. *Reading Research and Instruction*, 40(4), 315–331.
- Morais, J. (2003). Levels of phonological representation in skilled reading and in learning to read. *Reading and writing*, 16(1), 123-151.
- Moreno, R., Mayer, R. E., Spires, H. A., & Lester, J. C. (2001). The case for social agency in computer-based teaching: do students learn more deeply when they interact with animated pedagogical agents? *Cognition and Instruction*, 19(2), 177-213.
- Najjar, L. J. (1998). Principles of educational multimedia user interface design. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 40(2), 311-323.
- Neo, M. (2005). Engaging Students in Group-based Co-operative Learning-A Malaysian Perspective. *Journal of Educational Technology & Society*, 8(4), 220-232.
- Neo, M., & Neo, K. T. K. (2001). Innovative teaching: Using multimedia in a problem-based learning environment. *Journal of Educational Technology & Society*, 4(4), 19-31.
- Nielsen, J. (1993). *Usability engineering*. San Diego: Morgan Kaufmann Publishers.

- Nielsen, J. (2006). Quantitative Studies: How Many Users to Test? Retrieved November 29, 2008, from http://www.useit.com/alertbox/quantitative_testing.html.
- Ojo, A & Estevez, E. (2005). Object-Oriented Analysis and Design with UML. E-Macao Report 19.
- Olson, R. K., Wise, B. W., Ring, J., & Johnson, M. (1997). *Computer-based remedial training in phoneme awareness and phonological decoding: Effects on the post-training development of word recognition*. *Scientific Studies of Reading*, 1, 235–253.
- Pelgrum, W. J., & Anderson, R. E. (1999). *ICT and the emerging paradigm for life long learning: A worldwide educational assessment of infrastructure, goals and practices*: International Association for the Evaluation of Educational Achievement.
- Plowman, L., & Stephen, C. (2005). Children, play, and computers in pre- school education. *British journal of educational technology*, 36(2), 145-157.
- Pohradsky, P., Londájk, J., & ČiEacìEikova, M. (2010). Application of ICT in pre-school education. Paper presented at the ELMAR, 2010 PROCEEDINGS.
- Plowman, L., & Stephen, C. (2003). A ‘benign addition’? Research on ICT and pre school children. *Journal of Computer Assisted Learning*, 19(2), 149-164.
- Raphan, D. (1996). A Multimedia Approach. *TESOL Journal*, 6(2), 24-28.
- Reddi, U. V., & Mishra, S. (2003). *Educational multimedia: A handbook for teacher-developers*: Commonwealth Educational Media Centre for Asia.

Roger Wambolt (2010), Painter Essentials 4 for Kids from

<http://www.corel.com/content/pe4/pdfs/painter-essentials-4-for-kids.pdf>

Salim, Trigui Mohamed (2009) *Arabic Language Learning (ALL) for Kids*. Masters thesis, Universiti Utara Malaysia.

Schnackenberg, H. L., Luik, K., Nisan, Y. C., & Servant, C. (2001). A case study of needs assessment in teacher in-service development. *Educational Research and Evaluation*, 7(2-3), 137-160.

Segers, L., & Verhoeven, L. (2002). Multimedia support of early literacy learning. *Computers and Education*, 39, 207–221.

Seymour, P. H. K., L.G & Bolik, F. M. (1999). Rhymes and phonemes in the common unit task: Replications and implications for beginning reading. *Journal of Research in Reading*, 22(2), 113–130.

Sharpe, A. and Gharani, L. (2001) "*Trend Productivity in the New Economy: A Survey*," vol. Master degree. Montreal, Quebec: McGill University, pp. 65.

Sharpe, A., & Gharani, L. (2001). *Trend Productivity in the New Economy: A Survey*. Paper presented at the Centre for the Study of Living Standards. Paper prepared for the Canadian Economics Association meetings.

Sidhu, S. M., & Ramesh, S. (2008). Technology Assisted Problem Solving Packages for Engineering. *Adapting information and communication technologies for effective education*, 2, 73.

Sidhu, M. S (2004). Hardware and Software for Multimedia Development.

Siribodhi, T. (1995). Effects of three interactive multimedia computer assisted language learning programs of elementary level EFL students. University of Kansas.

Siribodhi, T. (1995). Effects of three interactive multimedia computer-assisted language learning programs on the vocabulary acquisition of elementary level efl students.

Sivin-Kachala J and Bialo E. (2000) 2000 Research Report on the Effectiveness of Technology in Schools. 7th ed., Software and Information Industry Association, Washington, DC.

Swaminathan, S and Wright, J. L. (2003) '*Educational technology in the early and primary years*', in J. P. Isenberg and M. R. Jalongo (eds) *Major Trends and Issues in Early Childhood Education*, 2nd edn, pp. 136–49. New York: Teachers College Press.

Viadero, D. (2005) 'Pressure builds for effective staff training'. *Education Week* 24(43): 1, 18–19, 21.

Threinen, C. P. (2007). Painter x wow! book, the Book© 2007 ISBN: 0321503252
9780321503251."

- Tilley, S., & Huang, S. (2003). *A qualitative assessment of the efficacy of UML diagrams as a form of graphical documentation in aiding program understanding*. Paper presented at the Proceedings of the 21st annual international conference on Documentation.
- Torgesen, J. K. (2000). Individual differences in response to early interventions in reading: The lingering problem of treatment resisters. *Learning Disabilities Research & Practice, 15*(1), 55-64.
- Tuxpaint drawing application. Available at <http://www.tuxpaint.org> [Accessed 5 August 2009].
- Uimonen, T. (2000). *Rational Rose*. Retrieved May 1, 2011, from Scribd web site: <http://www.scribd.com/doc/50279640/Rose>.
- Vaishnavi, V., & Kuechler, W. (2008). *Design research in information systems*. *wwwisworldorg, 22*(2), 1-16.
- Van Daal, V. H. P., Reitsma, P., & Van Der Leig, A. (1994). Processing units in word reading by disabled readers. *Journal of Experimental Child Psychology, 57*, 180–21
- Vernadakis, N., Avgerinos, A., Tsitskari, E., & Zachopoulou, E. (2005). The use of computer assisted instruction in preschool education: Making teaching meaningful. *Early Childhood Education Journal, 33*(2), 99-104.

- Von der Maßen, T. and H. Lichter (2002). *Modeling variability by UML use case diagrams*. Proceedings of the International Workshop on Requirements Engineering for product lines, Citeseer.
- Warschauer, M., & Healey, D. (1998). Computers and language learning: An overview. *Journal of Language Teaching*, 31(2), 57-71.
- Weeks, M., Batatia, H., Sotudeh, R., Maierhofer, M., & England, U. K. (1998). Assessing the Feasibility of Using a Media I/O Processor in a VOD Server. *Journal of Technologies for the Information Society: Developments and Opportunities*. IOS Press, Amsterdam, 521–528.
- Whetstone, L., & Carr-Chellman, A. A. (2001). Preparing preservice teachers to use technology: Survey results. *TechTrends*, 45(4), 11-17.
- White, C. (2006). Distance learning of foreign languages. *Journal of Language Teaching*, 39(04), 247-264.
- Wikipedia. (2009). Computer-assisted language learning (CALL). Retrieved January 07, 2009, from http://en.wikipedia.org/wiki/Computer-assisted_language_learning
- Wise, B. W., Ring, J., & Olson, R. K. (1999). Training Phonological Awareness with and without Explicit Attention to Articulation* 1,* 2,* 3. *Journal of Experimental Child Psychology*, 72(4), 271-304.
- Wydra, E. W. (2001). The effectiveness of a self-care management interactive multimedia module. *Journal of Oncology Nursing Forum*, 28(9), 1399-1407.

www.designingforchildren.net/papers/h-hafit-designingforchildren.pdf

Xiao, L., & Dasgupta, S. (2002). *Measurement of User Satisfaction with Web-based Information Systems: an Empirical Study*. Paper presented at the Americas Conference on Information systems, America.

Zevenbergen, R. (2007). Digital natives come to preschool: implications for early childhood practice. *Contemporary Issues in Early Childhood*, 8(1), 1929.

Zhang, H., & Liang, Y. D. (2007). *Computer graphics using Java 2D and 3D*: Pearson Prentice Hall.

APPENDIX A

QUESTIONNAIRE

This questionnaire is divided into two parts the first part (Questionnaire for Children) by interview with children, and the second part (Questionnaire for Teachers and Parents) that include four sections (Section A, B, C and D). Section A addressing respondent general information. Section B measuring the learnability of (*EduPaint*). Section C measuring the Perceive of Usefulness of (*EduPaint*). Section D measuring the Perceive of Ease of Use. Respondent are required to answer all the questions in order to complete the session.

And thank you for participating in the application (Education Painter For Preschool Children). The survey is part of our research work to investigate the usefulness of the education painter for preschool children. We appreciate your kind cooperation in completing this questionnaire, and we ensure you that the data you provided will be treated as confidential and will be used for research purposes only.

If you have any questions about this survey or need our assistance, please contact us by phone at (0147538346) or by email at (Qa_matrix8@yahoo.com).

Part A: (Questionnaire for Children)

Section A. Respondent General Information

Please Kindly tick (✓), for relevant response:

Race: Malay [] Chinese [] Indian [] others [].

City: [].

Gender: Male [] , Female [].

Age: [].

*Please choose Yes or No for the following equation.

Section B. Interview

1. Do you like to use application (Education Painter for Preschool Children)?

Yes [] , No [].

Part B: (Questionnaire for Teachers and Parents)

Section A. Respondent General Information

Please Kindly tick (✓), for relevant response:

Race: Malay [] Chinese [] Indian [] others [].

City: []

Gender: Male [] Female []

Teacher: [] Parents: []

How many children: []

*Please use the scale of (1-5) and circle on the best answer suited for you.

1 = Strongly Disagree. 2 = Disagree. 3 = Neutral. 4 = Agree. 5 = Strongly Agree.

Section B. LEARNABILITY

It was easy to learn to use Education Painter for Preschool Children

1 2 3 4 5

2. Information provided by Education Painter for Preschool Children is easy to understand. 1 2 3 4 5.

3. The function provided in Education Painter for Preschool Children helped me in teaching process.

1 2 3 4 5

4. The ordering of information is logical.

1 2 3 4 5

Section C. USEFULNESS

1. Using Education Painter for Preschool Children would enhance my effectiveness in teaching the children.

1 2 3 4 5

2. Using Education Painter for Preschool Children would make it easier to teach.

1 2 3 4 5

3. I would find Education Painter for Preschool Children useful in my job.

1 2 3 4 5

Section D. EASE OF USE

1. Learning to operate Education Painter for Preschool Children would be easy for me.

1 2 3 4 5

2. I would find it easy to get Education Painter for Preschool Children to do what I want it to do.

1 2 3 4 5

3. My interaction with Education Painter for Preschool Children would be clear and understandable.

1 2 3 4 5

4. I would find Education Painter for Preschool Children to be flexible to interact with.

1 2 3 4 5

5. It would be easy for me to become skillful at using Education Painter for Preschool Children.

1 2 3 4 5

6. I would find Education Painter for Preschool Children easy to use.

1 2 3 4 5

Summary of questions and answers

A. Learn Ability

Table 1 learn ability

It was easy to learn to use Education Painter for Preschool Children?				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
30	30	30	30	30
0	0	4	16	10
Information provided by Education Painter for Preschool Children is easy to understand?				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
30	30	30	30	30
0	0	0	17	13
The function provided in Education Painter for Preschool Children helped me in teaching process.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
30	30	30	30	30
0	0	10	16	4
The ordering of information is logical.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
30	30	30	30	30
0	0	11	14	5

B. Usefulness

Table 2 Usefulness

Using Education Painter for Preschool Children would enhance my effectiveness in teaching the children.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
30	30	30	30	30
0	1	11	11	7
Using Education Painter for Preschool Children would make it easier to teach.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
30	30	30	30	30
0	1	0	17	13
I would find Education Painter for Preschool Children) useful in my job.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
30	30	30	30	30
0	0	5	17	8

C. Ease of use

Table 3 Easy of use

Learning to operate Education Painter for Preschool Children would be easy for me.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
30	30	30	30	30
0	0	5	11	14
I would find it easy to get Education Painter for Preschool Children to do what I want it to do.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
30	30	30	30	30
0	1	11	17	1
My interaction with Education Painter for Preschool Children would be clear and understandable.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
30	30	30	30	30
0	0	7	19	4
I would find Education Painter for Preschool Children to be flexible to interact with.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
30	30	30	30	30
0	0	10	13	7
It would be easy for me to become skillful at using Education Painter for Preschool Children.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
30	30	30	30	30
0	0	13	14	3

I would find Education Painter for Preschool Children easy to use.				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
30	30	30	30	30
0	0	1	16	13

APPENDIX B

SAMPLES OF THE TEST



Figure 1. Preschool



Figure 2. Use Application *EduPaint* (First Group)



Figure 3. Use Application *EduPaint* (Second Group)



Figure 4. Use Application *EduPaint* (Third Group)



Figure 5. Use Application *EduPaint* (fourth Group)



Figure 6. Use Application *EduPaint* (five Group)



Figure 7. Use Application *EduPaint* (Six Group)

APPENDIX C

EDUPAINT CODE

A. Code the Alphabet Letters:

```
public class LoadImageApp extends JPanel {
    static AudioClip spinSound;

    private Action action;

    // diffend button object for class Load image

    private JButton image1,image2,
    image3,image4,image5,image6,image7,image8,image9,image10,image11,image12,image1
    3,image14;

    private JButton image15,image16,
    image17,image18,image19,image20,image21,image22,image23,image24,image25,image2
    6;

    BufferedImage img;

    public LoadImageApp(Action inaction) {
        action = inaction;

        image for each object (button)

        image1      = new JButton("",new ImageIcon("A.jpg"));
        image2      = new JButton("",new ImageIcon("B.jpg"));
        image3      = new JButton("",new ImageIcon("C.jpg"));
```

```
image4      = new JButton("",new ImageIcon("D.jpg"));
image5      = new JButton("",new ImageIcon("E.jpg"));
image6      = new JButton("",new ImageIcon("F.jpg"));
image7      = new JButton("",new ImageIcon("G.jpg"));
image8      = new JButton("",new ImageIcon("H.jpg"));
image9      = new JButton("",new ImageIcon("I.jpg"));
image10     = new JButton("",new ImageIcon("J.jpg"));
image11     = new JButton("",new ImageIcon("K.jpg"));
image12     = new JButton("",new ImageIcon("L.jpg"));
image13     = new JButton("",new ImageIcon("M.jpg"));
image14     = new JButton("",new ImageIcon("N.jpg"));
image15     = new JButton("",new ImageIcon("O.jpg"));
image16     = new JButton("",new ImageIcon("P.jpg"));
image17     = new JButton("",new ImageIcon("Q.jpg"));
image18     = new JButton("",new ImageIcon("R.jpg"));
image19     = new JButton("",new ImageIcon("S.jpg"));
image20     = new JButton("",new ImageIcon("T.jpg"));
image21     = new JButton("",new ImageIcon("U.jpg"));
image22     = new JButton("",new ImageIcon("V.jpg"));
image23     = new JButton("",new ImageIcon("W.jpg"));
image24     = new JButton("",new ImageIcon("X.jpg"));
image25     = new JButton("",new ImageIcon("Y.jpg"));
image26     = new JButton("",new ImageIcon("Z.jpg"));
```

B. Code Drawing Tools:

```
if (drawMode == LINE)
{
    vLine.add(new Coordinate(x1,y1,event.getX(),event.getY(),foreGroundColor));
    undoStack.push(new StepInfo(LINE ,new
Coordinate(x1,y1,event.getX(),event.getY(),foreGroundColor)));
}

if (drawMode == RUBBER)//
{

    vRubber.add(new Coordinate(x1,y1,event.getX(),event.getY(),backGroundColor));
    undoStack.push(new StepInfo(RUBBER ,new
Coordinate(x1,y1,event.getX(),event.getY(),foreGroundColor)));

}

if (drawMode == AIRBRUSH)

// {
```

```

// vRubber.add(new Coordinate(x1,y1,event.getX(),event.getY(),backGroundColor));

// undoStack.push(new StepInfo(RUBBER ,new
Coordinate(x1,y1,event.getX(),event.getY(),backGroundColor)));

// vFreeHand.add(new Coordinate(linex1,liney1,linex2,liney2,foreGroundColor));

// undoStack.push(new StepInfo(FREE_HAND, new
Coordinate(linex1,liney1,linex2,liney2,foreGroundColor)));

// }

if (drawMode == SQUARE)
{
if(solidMode)
{
if(x1 > event.getX() || y1 > event.getY())
{
vSolidSquare.add(new
Coordinate(event.getX(),event.getY(),x1,y1,foreGroundColor));
undoStack.push(new StepInfo(SOLID_SQUARE, new
Coordinate(event.getX(),event.getY(),x1,y1,foreGroundColor)));
}
else
{
vSolidSquare.add(new
Coordinate(x1,y1,event.getX(),event.getY(),foreGroundColor));
undoStack.push(new StepInfo(SOLID_SQUARE, new
Coordinate(x1,y1,event.getX(),event.getY(),foreGroundColor)));
}
}
}
}

```

```

        }
    }
    else
    {
        if(x1 > event.getX() || y1 > event.getY())
        {
            vSquare.add(new
Coordinate(event.getX(),event.getY(),x1,y1,foreGroundColor));
            undoStack.push(new StepInfo(SQUARE, new
Coordinate(event.getX(),event.getY(),x1,y1,foreGroundColor)));
        }
        else
        {
            vSquare.add(new
Coordinate(x1,y1,event.getX(),event.getY(),foreGroundColor));
            undoStack.push(new StepInfo(SQUARE, new
Coordinate(x1,y1,event.getX(),event.getY(),foreGroundColor)));
        }
    }
}
if (drawMode == this.OVAL)
{
    if(solidMode)
    {
        if(x1 > event.getX() || y1 > event.getY())
        {

```

```

        vSolidOval.add(new
Coordinate(event.getX(),event.getY(),x1,y1,foreGroundColor));

        undoStack.push(new StepInfo(SOLID_OVAL, new
Coordinate(event.getX(),event.getY(),x1,y1,foreGroundColor)));
    }
    else
    {

        vSolidOval.add(new
Coordinate(x1,y1,event.getX(),event.getY(),foreGroundColor));

        undoStack.push(new StepInfo(SOLID_OVAL, new
Coordinate(x1,y1,event.getX(),event.getY(),foreGroundColor)));
    }
}
else
{
    if(x1 > event.getX() || y1 > event.getY())
    {

        vOval.add(new
Coordinate(event.getX(),event.getY(),x1,y1,foreGroundColor));

        undoStack.push(new StepInfo(OVAL, new
Coordinate(event.getX(),event.getY(),x1,y1,foreGroundColor)));
    }
    else
    {

        vOval.add(new
Coordinate(x1,y1,event.getX(),event.getY(),foreGroundColor));

```

```

        undoStack.push(new StepInfo(OVAL, new
Coordinate(x1,y1,event.getX(),event.getY(),foreGroundColor)));
    }
}
}
if (drawMode == this.POLYGON || drawMode == this.SOLID_POLYGON)
{
    xPolygon.add(new Integer(event.getX()));
    yPolygon.add(new Integer(event.getY()));
    polygonBuffer = true;
    repaint();
}
if (drawMode == this.ROUND_RECT)
{
    if(solidMode)
    {
        if(x1 > event.getX() || y1 > event.getY())
        {
            vSolidRoundRect.add(new
Coordinate(event.getX(),event.getY(),x1,y1,foreGroundColor));
            undoStack.push(new StepInfo(SOLID_ROUND_RECT, new
Coordinate(event.getX(),event.getY(),x1,y1,foreGroundColor)));
        }
    }
    else
    {

```



```

        vSolidRoundRect.add(new
Coordinate(x1,y1,event.getX(),event.getY(),foreGroundColor));

        undoStack.push(new StepInfo(SOLID_ROUND_RECT, new
Coordinate(x1,y1,event.getX(),event.getY(),foreGroundColor)));
    }
}
else
{
    if(x1 > event.getX() || y1 > event.getY())
    {
        vRoundRect.add(new
Coordinate(event.getX(),event.getY(),x1,y1,foreGroundColor));

        undoStack.push(new StepInfo(ROUND_RECT, new
Coordinate(event.getX(),event.getY(),x1,y1,foreGroundColor)));
    }
    else
    {
        vRoundRect.add(new
Coordinate(x1,y1,event.getX(),event.getY(),foreGroundColor));

        undoStack.push(new StepInfo(ROUND_RECT, new
Coordinate(x1,y1,event.getX(),event.getY(),foreGroundColor)));
    }
}
}
x1=linex1=x2=linex2=0;
y1=liney1=y2=liney2=0; }

```

C. Code Sound with Alphabet Letters (pronunciation)

```
if (drawMode == IMAGE1)/
{
    try
    {
        spinSound = Applet.newAudioClip(new URL("file:" + "B.wav")); // function for load
sound with load image

        spinSound.play();

        // spinSound = Applet.newAudioClip(new URL("file:" + "1.Mp3"));
// spinSound.play();
    }
    catch (Exception ex)
    {
    }

    ImageIcon icon1 = new ImageIcon("D:/QUSAY PROJECT11/Image/B.jpg");// function
for load image in the interface

    B1[I]=new JButton("(" + Integer.toString(I+1) + ")", icon1);

    B1[I].setBounds(30, 145+P, 170, 152);

    this.add(B1[I]);

    repaint();}
```

Thank you for your cooperation and Efforts