

Learning through games using multimedia courseware for primary school students

by

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CERTIFICATION OF APPROVAL

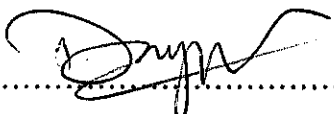
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Siti Farahiyah Binti Ab Wahab

A project dissertation submitted to the
Information Technology Programme,
Universiti Technology PETRONAS
in partial fulfillment of the requirement for the
BACHELOR OF TECHNOLOGY (Hons)
(INFORMATION AND COMMUNICATION TECHNOLOGY)

Approved by,



.....

(Dr Dayang Rohaya Awang Rambli)

UNIVERSITI TECHNOLOGY PETRONAS
TRONOH, PERAK
SEPTEMBER 2006

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the reference and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or person.



.....
(Siti Farahiyah Binti Ab Wahab)

ABSTRACT

This project presents a preliminary work on examining the importance of incorporating the elements of games, in particular complex games, in the design of an interactive multimedia-learning environment to enhance and create an engaging learning experience. A review suggests that computer games have the potential to enhance the learning environment; in part due to its interactive and engagement attributes. The result of an informal survey reveals that "Fraction", one of the mathematic topics taught at schools was identified as one of the most difficult topics to teach. Thus development of the prototype software was based on this topic. An initial examination of two current multimedia courseware CDs used for Mathematic Year 3 under this topic has revealed that most of the contents in the CDs have integrated all the multimedia elements such as text, image, audio and graphics but it lacks interactive games and activities that could stimulate enjoyment and motivation for learning. Activities found consist mainly of simple or trivial games that do not lend to sustained engagement. The architecture and the preliminary design of the prototype software that integrate complex games are described. To form the basis of the courseware development, a pre-survey questionnaire was conducted to find out students interest on computer games. The results of the survey showed that 100% or 60 out of 60 respondent express interest and engage on games. The result of the analysis provides motivations for the development of the learning through games courseware. The development of the courseware is based on the courseware development framework which will analyze the requirement and courseware specification, the initial storyboard, designation of multimedia, the integration of the storyboard and the design itself and also the testing on the courseware. The result of testing on the courseware shows that by integrating complex games elements and multimedia elements on courseware may help students understand and motivate them to learn. In conclusion, a courseware with additional games elements could be an interactive and more interesting usable courseware.

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CHAPTER 1

INTRODUCTION

This chapter introduces the project background, problem statement, project objectives and project scopes. The motivation that leads to the project development is also described. This includes a detail report on the evaluation of two educational CDs courseware for Mathematics Year 3 under fraction topic from Awan Metro (M) Sdn Bhd and Arus Intelek Sdn Bhd. which highlighted the problem of minimal entertainment and interactivity offered by these applications. The Learning through Games courseware is developed to enhance the existing courseware CDs that being used by primary school students in school. Based on the background and evaluation of the CDs, the objectives of the project are formulated.

1.1 Background

Nowadays, technology has started to change the method of teaching and learning. The integration of multimedia becomes a famous tool in teaching and learning environment. Multimedia has been placed at the center of current developments in learning technology. While “Computer games” is a term that is widely used to describe many different activities on the computer. Games provide a forum in which learning arises as a result of tasks stimulated by the content of the games, knowledge is developed through the content of the games, and skills are developed as a result of playing the game. There is a widely held view that games software is capable of developing a degree of user engagement which could be usefully connected in an educational context especially for primary school students. Digital game learning describes the application of digital computer based games to learning and terms of educational purposes offers unique knowledge construction opportunities.

Currently, courseware has been used in many schools and home for effective learning through interactive multimedia software. The term “interactive” implies that the media responds to some input from the users. Uses of interactive multimedia programs that help develop skills in both language and subjects’ areas should enhance student achievement and beliefs in their abilities in both areas more than traditional classroom instruction. It is one of the edutainment materials which are able to attract users especially kids. Thus, by integrating games and multimedia elements in the courseware, the learning session becomes more interesting and enjoyable which will motivate students towards learning.

1.2 Motivation

Throughout this project, the author has evaluated the CDs courseware for Mathematics Year 3 under fraction topic from Awan Metro (M) Sdn Bhd and Arus Intelek Sdn Bhd. The CDs have been approved by Ministry of Education Malaysia. Based on the evaluation, the author have found out that most of the contents in the CDs have fully integrate all the multimedia elements such as text, image, sound and graphics but they are lack of interactive games and activities in the courseware. On the other hand, there are encouraging signs that game playing can actually benefit school performance. For example, the Pillay (2003) study found signs that:

.....playing recreational computer games may influence children's performance on subsequent computer-based educational tasks. However, the extent of this influence depended on the types of games played during the learning phase. Linear cause and effect games tended to encourage means-end analysis strategy, whereas adventure games encouraged inferential and proactive thinking.

Below are some snapshots of fraction activities included in the CDs from Awan Metro Sdn Bhd. on fraction:

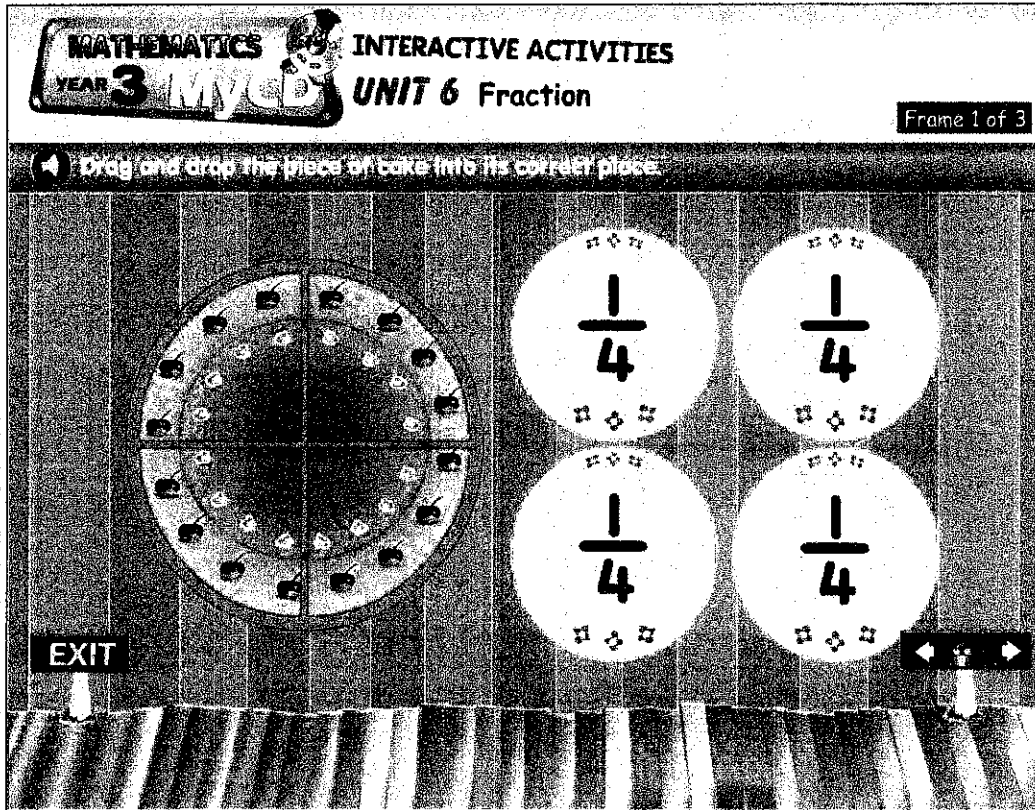


Figure 1: Snapshots 1

In Figure 1, the question is simple and straightforward. The students are required to drag and drop the part of cake onto the plate. There is integration in multimedia elements such as text, audio and image but it lacks of interactive activities where can stimulate enjoyment and motivation for students. This type of activity is most suitable for level 1 games activity.

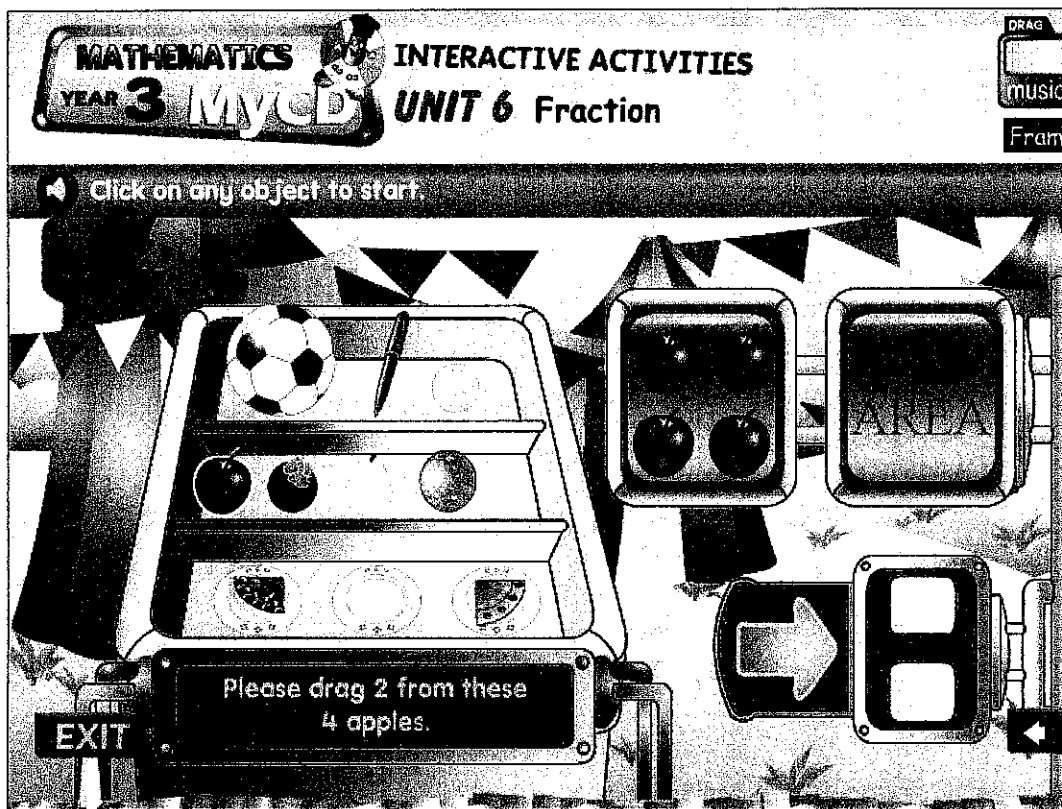


Figure 2: Snapshots 2

The above figure shows the activities required the students to drag any items from the tray onto the blue box where they have to drag the objects on the drop area based on the statement stated at the bottom of the page. Instead of drag and drop the items and key in the answer in the white box, perhaps the courseware can create a situation like an animated story where the students enjoy the situation while answering the questions.

MATHEMATICS INTERACTIVE ACTIVITIES
YEAR 3 MYCD **UNIT 6** Fraction

DRAG
 MUSIC
 Frame 3 of 3

Click on the correct answer.

How many slices of pizza have been eaten?

$\frac{1}{2}$ $\frac{1}{4}$ $\frac{2}{4}$
 $\frac{3}{4}$ $\frac{4}{4}$

Figure 3: Snapshots 3

The above frame shown in the figure represents some interactive activity where the question is built with animation instead of static image compared to the other 2 figures. However, it can be enhance with games elements or simulation where in order to answer the questions, the students have to get a key or clue from the games played.

The author also have evaluated Mathematics CDs for Year 3 on fraction topic from Arus Inteltek Sdn Bhd. Based on the CDs, it only use presentation slides as the presentation medium in teaching the students. While for questions and activities, it lacks some interactive elements such as when the user click on any unit as shown in Figure 4, a new page that link to Microsoft Word will take place. The questions are resided in a word page shown in Figure 5 where the students have to circle the answers directly or on a printed paper form.

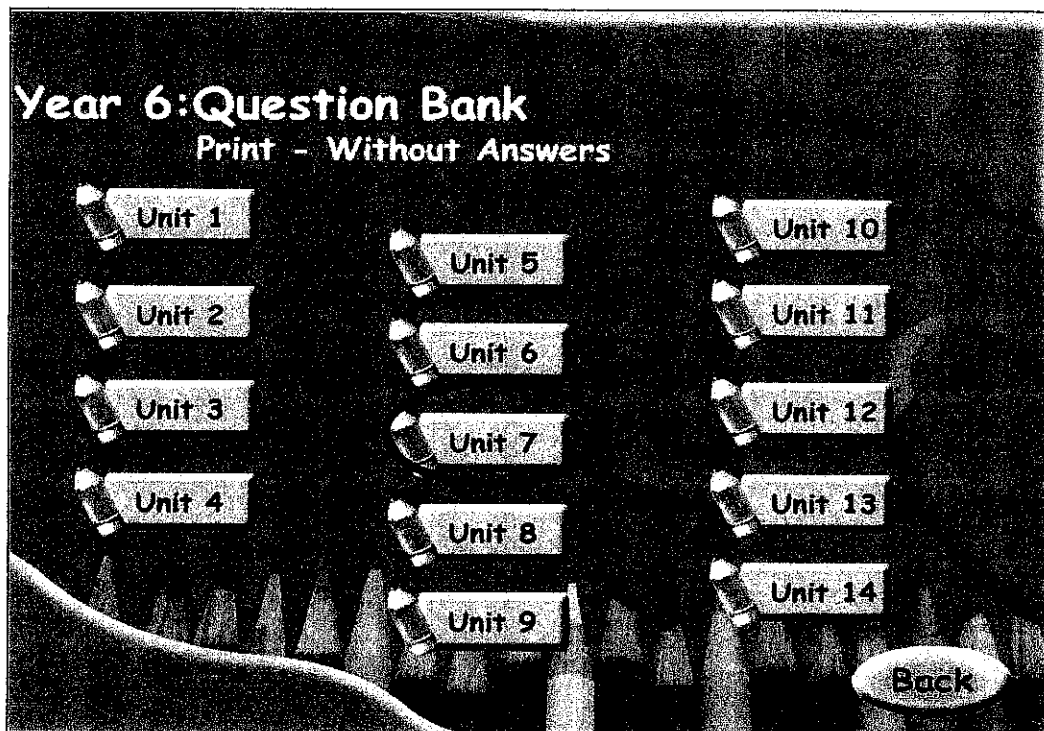


Figure 4: Snapshots 4

Answer all the questions.

A... Circle the correct answers.

1.

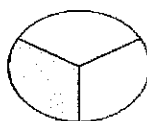


FIGURE 1

What is the fraction shaded on the shape in Figure 1?

A $\frac{1}{2}$

B $\frac{1}{3}$

C $\frac{1}{4}$

2.

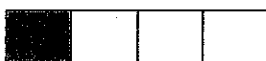


FIGURE 2

What is the fraction shaded on the shape in Figure 2?

A $\frac{1}{4}$

B $\frac{1}{3}$

C $\frac{1}{2}$

Figure 5: Snapshots 5

Based on the evaluation on these CDs, with the limitation of the interactivity in the courseware, less information and questions provided and lack of user friendliness, it provides motivations for the development of the learning through games courseware. The development of the courseware will be based on the courseware development framework which will be discussed in Methodology chapter.

1.3 Problem Statements

1.3.1 Problem Statements

As technology is being integrated into class curricula and more on-line courses are offered in many educational institutions, there is a need to examine the ways technology is used in these courses and to recognize the ways technology could positively affect students' learning. Nowadays, there are many courseware being developed for kids. However the author intends to come out with a multimedia courseware that integrate with computer games. There are many claims found in the literature for and against the usefulness of games in encouraging learning. It is

asserted that the use of such games can stimulate the enjoyment, motivation and engagement of users, aiding recall and information retrieval. Certainly many games teach valuable cognitive and social skills moreover formal education can be more productive when it has a certain amount of entertainment built in.

Based on the evaluation on the existing courseware CDs, the author conclude that most of the courseware used by kids in school is quite simple in terms of it multimedia elements, questions designed, the user friendliness of it and etc. There is a CD used that requires the kids to answer the questions directly in Microsoft Word or print and answer it manually. Yet if the kids answer it directly, they have to print and submit it to their teachers in order to get the score. This will make them easily get bored and time wasted. With the limitation of these elements, it does not really stimulate engagement to kids in learning.

1.3.2 Significant of the Project

By integrating the new mechanism of education and entertainment in terms of games, the courseware can stimulate enjoyment, motivation and engagement of users and can also encourage the development of various social and cognitive skills.

1.4 Objectives

The objectives of this project are:

1. To develop a multimedia courseware on fraction topic, one of the syllabus in mathematic with interactive features for standard 3 students.
2. To increase the way of presenting the interactive learning content by integrating the contents with games.

1.5 Scope of Study

1.5.1 Scope

In developing the project, there are several limitations has been observed. Generally the target users for the courseware are standard three students of primary school students. In order to develop the courseware it needs features and functions that could be understood and observable by these types of users.

The scope of the courseware is described below:

1. This application will be based on learning through games which need an interaction from the students with the courseware. It is a combination of the contents materials along with games in order to make the students aware and fully utilize the courseware.
2. The courseware contents are designed following the primary school mathematics syllabus for standard 3 in English language. The topic chosen is fraction which is part of important topics in mathematics subject. All the contents will be taken from the books, internet, and subject matter experts from this field. This courseware can be in a CD based method or an online courseware depending on the availability of the users.

1.5.2 Feasibility of the project within scope and time frame

For this project, 6 months period is allocated for developing the project. The Gantt chart shows the entire workflow for the project development including the activities involved for each stage in courseware development framework. (A detail Gantt chart is attached in APPENDIX I)

CHAPTER 2

LITERATURE REVIEW AND THEORY

In this chapter discussed on the detailed of information on multimedia, games and computer based learning environment. First study discussed on the importance of multimedia in educational courseware. Next study on the research paper review which discussed on the contribution of games in education. The third study was discussed on the complex games and how it gives impact to students in learning. Lastly, on how to create engagement in computer based learning environment (CBLE).

2.1 Why multimedia in educational courseware?

Multimedia is being used increasingly to provide computer based instruction. One reason for this trend may be the assumption that multimedia information helps people learn. Educational multimedia with its high storage capacity for words, diagrams, photographs, sounds, animation can present the broad concepts and the illuminating detail of the natural sciences. And, moreover, multimedia can present information on non-linear way giving learners the chance to explore it at will and to sense for themselves the natural patterns suggested. Applying multimedia technology to any computer application is neither easy nor inexpensive. It usually requires considerable up-front investment of time and money. The benefits of applying multimedia are:

2.1.1 Ease of use

The purpose of applying multimedia to any computer based application usually revolves around making the application easier to use. The productivity benefits of making work easier are enormous. By applying an intuitive and easy to follow front end to an application, the author can increase the user effectiveness considerably. For

example, as the program becomes easier to operate with a multimedia interface, the user becomes less dependent on instructions.

2.1.2 Better understanding of the content

Multimedia enhance computer-based training (CBT) enable student to better comprehend the material. Concurrent presentation of text, images, animation, video and sound complement each other to provide richer and broader range of information. Many studies had shown that students learn better and more easily when information is presented in ways that stimulate several of the students' senses concurrently.

2.1.3 Intuitive interface

It is not sufficient to simply apply multimedia elements to an interface and expect to gather the benefits without some strategic planning. To succeed, the multimedia interface must be intuitive, which means that the choice of images, icons, visual and audible responses also reaction to user input is obvious. At the same time, the user knows to choose the button for a function simply because the button looks like what it's intended to do.

2.1.4 Self paced interaction and better retention

The notion of self-paced learning is an old one, but it increase most in the world of multimedia, especially in computer-based training (CBT). Many studies have been done on the benefits of user controlled presentation of media and information.

2.1.5 More fun and greater efficiency

By making a multimedia application more fun to use, we also can make it efficient. Some cultures have difficulty with the concept of associating fun with efficiency, but take a good look at the way we can use fun to our advantage.

2.2 Research paper review

2.2.1 An exploration by TEEM of the contribution which games can make to the education process.

The initiation of this research paper comes from the journal written by Professor Angela McFarlane, Anne Sparrowhawk and Ysanne Heald. The title of the journal is "Report on the educational use of games: An exploration by TEEM of the contribution which games can make to the education process." The purpose of the journal is to explore the notion of the computer game, understand the complexity of the genres, and identify what if anything particular types of game might contribute to the development of learning related skills or the knowledge of content. They also consider the match and mismatch between these skills and content and those recognized as valuable within traditional educational settings. For the purpose of the study, they have provided a framework that the teachers can give to a small sample of parents, who contribute evidence on home use, conducted a focus group amongst the teacher evaluators to explore the issues further and distributed some 800 questionnaires to pupils and analyzed over 700 completed responses.

Subject

Subjects were divided into two groups that are parents who reflected a wide range of interest in and experience of using software with their children while pupils who are the one play the games.

Data Collection Method

Data is gathered through two methods that are 1) evaluation form and 2) questionnaires. The questions about game use at home have been identifies through

evaluation form while the questionnaires is concerned on the subjects' preferences on the games in learning.

Results

Table 1: Parents' views of subjects' computer games develop

Subjects parents suggested	% of sample questioned
Mathematics	45
Spelling	30
Reading	22
Logical Training	12
Computer Literacy	10
General knowledge	2
Science	2
History	2
Geography	2
Creative arts	2
Hand-eye co-ordination	2

In Table 1, the results indicates that almost half of parents questioned believe that computer games have helped with Mathematics in some way, a third that computer games contribute to spelling and almost a quarter that reading is enhanced by the use of the computer. 10% of parents see computer literacy as knowledge learnt and 12% of parents' identical logical thinking as a valued outcome. Science, history and geography were mentioned by at least 2 parents in each case, as were hand eye coordination, creative are skills and general knowledge.

Analysis of pupil questionnaires

Table 2: How long do they play

Options	Average	
	Girls	Boys
Up to 30 minutes	29.8	11.4
Up to 1 hour	38.5	28.7
Up to 2 hours	15.1	23.6
More than 2 hours	16.6	36.4

The majority of pupils play games at home, most frequently in their rooms. Not surprisingly games are played at weekends and after school. There is a tendency among girls to play games when they are bored or have nothing more interesting to do, whereas boys are more likely to play games as a first choice activity.

The use of such games can stimulate the enjoyment, motivation and engagement of users, aiding recall and information retrieval, and also can encourage the development of various social and cognitive skills. Indeed, it is a necessary development if we are to reach out to current and future generations in ways that cater for their needs and expectations.

2.2.2 Complexity Matters

“Complexity Matters” is a journal written by Marc Prensky that researched on the complexity of educational games. The purpose of the journal is to help all unaware parents, and teachers and other adults to understand what these new “complex” games are, and why they are so important to kids, to education, and, ultimately, to everyone. “Because of these formative games – playing experiences growing up, when today’s teacher hears the word game, their first reaction is trivial.” They don’t want this trivial stuff to be part of their child’s or children’s serious education, so they reject games. Previously, most teachers and parents think of and express an opinion about games in education, they are thinking only of mini-games like quiz which are best known as entertainment games. It has little complexity and typically provides only one single type of challenge.

A complex game adapts to each player’s skills and abilities through highly advanced artificial intelligence programs that sense just how a player is doing and then change the game slightly whenever the player leaves the “flow zone” in order to move that player back into it.

Goals in complex games are goals kids can relate to, often requiring the player to “be the hero” and take the role of someone accomplishing many difficult and demanding tasks. Goals are provided on several levels, including very short term goals. In many today’s complex games, precise goals are not provided but are rather left for players to set for themselves. It hardly needs mentioning that the goals we set for ourselves are the ones that are most motivated to reach. Complex games employ in much broader, deeper and complicated combinations of story, skills and required mastery. Complex games force players to make interesting and important decisions during every second of play.

2.2.3 The impact of digital games in education

This journal is written by Begona Gros that based on the idea that virtual learning is central in current society, and that the key aspect of this kind of learning is not so much technology itself but the interaction of the learner with the technology. Children gain access to the world of digital culture via digital games. Games have a major educational potential where it can motivate the students where it can help them to develop skills, abilities and strategies. The game is integrated in a context that establishes its own rules as to how it should be used in order to derive maximum educational benefit. *Calvo (1997)* stated that games can enhance the following functions:

- I. Motor development – Games often involve movement; they stimulate precision, coordination of movements and speed.
- II. Intellectual development – As well as movement, games may also involve understanding how things work, resolving problems, devising strategies and etc.

III. Affective development – The fictional nature of games, the opportunity to act out of a role means that they have a key function in the affective development of the individual. Games stimulate students to understand their life experiences and help them to mature.

IV. Social development – Games are also ways of relating to others. In addition to their socializing dimension, their capacity to symbolically generate roles makes them effective transmitter of society’s predominant values and attitudes.

Based on research journal, McFarlane (2002) show that most teachers acknowledge games contribute to the development of a wide variety of strategies that are extremely important for learning. Table below shows the additional areas of learning in which video games can contribute.

Table 3: Areas of learning in which video games can contribute

Personal and social development	<ul style="list-style-type: none"> ❖ Provide interest and motivation to learn. ❖ Maintain attention and concentration.
Language and literacy	<ul style="list-style-type: none"> ❖ Encourage children to explain what is happening. ❖ Use talk to organize, sequence and clarify thinking, ideas, feelings and events.
Mathematical development	<ul style="list-style-type: none"> ❖ Use everyday words to describe position.
Creative development	<ul style="list-style-type: none"> ❖ Respond in a variety ways ❖ Use their imagination in art and design music, and stories.
Knowledge and understanding of the world	<ul style="list-style-type: none"> ❖ Use early control software to investigate direction and control.
Physical development	<ul style="list-style-type: none"> ❖ Fine motor control can be developed with the increased refinement in using a mouse for navigation and selecting objects.

2.2.4 Creating engagement in computer based learning environment

This article was written by Marshall G. Jones discussed on how to build engaging computer based learning environments (CBLE). It move from Flow theory to computer games and back again.

Defining engagement

Interest in the content, or having a well defined question, provides the learner with intrinsic motivation to be working within the environment. The author has defined engagement as the nexus of intrinsic knowledge and or interest and external stimuli that promote the initial interest in and continued use of a computer based learning environment. In a computer based learning environment, the program that can make the learner want to be there is known as engagement.

Flow theory

Flow theory is described as the feeling of optimal experience. It is often experienced during physical activities because of the ability to realize the manifestations of the requirements of a flow experience. For many people finding a moment of flow can be when they are doing things that they enjoy and excel at, although flow can be experienced by nearly anyone when they are competing in an environment that is appropriate to their skills.

Within flow theory, *Csikszentmihalyi (1990)* defines the difference between enjoyment and pleasure. Enjoyment is characterized by the feeling of forward movement, or a sense of accomplishment. Pleasure can give enjoyment and can even contribute to enjoyment. However, pleasure is defined as being passive in nature, while enjoyment requires direct participation by an individual. An optimal experience is more of a manifestation of enjoyment than pleasure.

Cognition and Flow

Cognition and flow as it relates to CBLE's. Norman (1993) discussed on two kinds of cognition: experiential and reflective. Experiential cognition is one where one may react to events efficiently and effortlessly. For example it would be the way people who play action games such as *Counter Strike* exhibit this type of cognition. It is a combination of skills, reflexes and knowledge that comes together after many hours of practice. While reflective cognition is the comparison and contrast of thought and decision making. It is the type of cognition that leads to new ideas and novel responses. Strategy games such as *Warcraft* require the use of this type of cognition. In working with complex tasks, it is usually necessary to combine both reflective and experiential cognition to solve problems.

Table 4: Relationship between flow, games and design of CBLE's.

Elements of flow	Manifestation in a game	Possible manifestation in a CBLE
1. Task that we can complete.	The use of levels in a game provides small sections that lead to the completion of the entire task.	Exercises relevant to the content area that provide "drill and practice" types of activities might provide learners with areas of skill to focus on. Also aids in reinforcement.
2. Ability to concentrate on task.	Creation of convincing world that draws users in. The Dungeons and Labyrinths in Doom II help you suspend your belief systems for a time.	Creation of seamless integration of tools, tasks and presentation of information.
3. Task has clear goals.	Survival, collection of points, gathering of objects and artifacts, solving the puzzle.	Provide problems within a learning environment. Despite the desire to have learners

		determine their own problems, it can help to have initial problems identified for them.
4. Task provides immediate feedback.	Shoot people and they die. Find a clue and you can put it in your bag.	Combining appropriate tools with the software can provide users with mechanism for meeting goals and gaining feedback from the software.
5. Deep but effortless involvement (losing awareness of worry and frustration of everyday).	The creation of environments that are far removed from what we know to be real helps suspend belief systems and take one away from the ordinary.	Keeping the visual appearance of the environment can maintain consistency which may help keep users focused on the task at hand. Less environmental juxtaposition may help keep users focused.
6. Exercising a sense of control over their actions.	Mastering the controls of the game, such as mouse movement or keyboard combinations.	Providing for more direct control by the learner. More learner directed movement than designer determined paths.
7. Concern for self disappears during flow, but sense of self is stronger after flow activity.	Many games provide for an environment that is a simulation of life and death. One can cheat death and not really die. People stay up all night to play these games. It is the creation of an integration of presentation, problem and control over the system that promote this.	Tools that promote self confidence (achievable goals, tasks that are level appropriate) can help strengthen sense of self and help generate greater self efficacy.

2.3 Summary

Based on research above, games is very important in computer based learning environment (CBLE) as it can stimulate the enjoyment, motivation and engagement of users, aiding recall and information retrieval and also can encourage the development of various social and cognitive skills. It is integrated where it establishes its own rules in order to derive maximum educational benefit. Definitely, it is necessary developments if we are reach out to current and future generations in ways that cater for students' need and expectation. Through games, it can motivate the students in a way that can help them to develop skills, abilities and strategies. In the research, it also has stated that games can contribute to several areas of development such as personal and social development which it maintain attention and concentration of students towards learning. Creative development is also one of the areas where it allows them to use their imagination in art and design, music and stories.

In the fourth journal it stated that flow theory and cognition are related in computer based learning environment (CBLE). Both of these terms can be used to create engagement in learning. For flow theory, it emphasize on the feeling of experience while for cognition, it has divided into two kinds; experiential and effortlessly. These two cognitions covered where one may react to events efficiently and effortlessly and lead to new ideas and decision making. Thus, the engagement towards learning can be stimulated by integrating all these elements in the courseware. Activities found in the courseware consist mainly of simple or trivial games that do not lend to sustained engagement. Hence, with the research done by Mark Prensky on complexity matters, a complex game is discussed. A complex game requires the player to "be the hero" and take the role in accomplishing many difficulty and demanding tasks. Goals are usually provided on each level including very short term goals. With the integration of complex games, multimedia elements, flow theory and cognition elements, the engagement and motivation towards learning can be stimulated to the users.

In complex games, it allowed users to make choices and made use of the ability during the game. It let to replay previously played levels and almost always finished each level before moving on to the next. Consequently, the aspects of those factors can be used in the design of new educational courseware to increase motivation and those factors showing differences can be used to develop applications for specific group of students. Future work is focused on the incorporation of these findings into educational games and other activities to enable the author to evaluate the students' effect on motivation and performance. This project's goal is to develop courseware that increases the motivation of the user to learn new skills and to be persistence in the participation of the activity.

CHAPTER 3

METHODOLOGY/PROJECT WORK

This section describes details of method that will be used for the entire development project. This section consists of two subtopics known as procedure identification and tools used. For procedure identification based on courseware development framework which consists of seven stages known as Courseware Specification, Instructional Design, Multimedia Design, Multimedia Development, Courseware Integration, Testing and Maintenance. The other subtopic presents the tools used to define the software and hardware requirement for the development of this product.

3.1 Procedure Identification

The author has decided to adopt the Courseware Development model designed by *Tasos Koutoumanos* (1996) as is illustrated in Figure 6. In this model each phase well defined starting and ending point, with identifiable deliveries to the next phase. It enables the author to rapidly create courseware designs that will meet learning requirements. The stages are courseware specification, instructional design, multimedia design, multimedia development, courseware integration, testing and maintenance. Its longevity has been due to the advantages that it offers to the users. A schedule can be set with deadlines for each stage of development and a product can proceed through the development process. The courseware development model that has been implemented in developing this “Learning through games” courseware is using top down approach that breaks the tasks into a series of necessary sub goals.

3.1.1 Courseware specification

Through a comprehensive set of interviews, a profile of the target audience is created and the features and benefits of the content redesign are identified. The needs analysis establishes the objectives, requirements and benefits for the project that is underway.

3.1.2 Instructional Design

The instructional design is similar to an architect creating initial blueprints for a building. It provides the framework for the course outline with course title, modules, lessons and objectives. This framework also includes an initial storyboard for one lesson to ensure the design approach is in keeping with the objectives.

3.1.3 Multimedia Design

Multimedia design is the use of computers to present text, graphics, video, animation, and sound in an integrated way. Nearly all PCs are capable of displaying video, though the resolution available depends on the power of the computer's.

3.1.4 Multimedia Development

The develop stage features the integration of artwork and instructional design. Lessons are created from the design storyboards culminating in an Alpha version of the product.

3.1.5 Courseware Integration

The integration stage features the creation of the beta version of the product. The beta version of the product includes integration of content such as video, audio, Flash, animation, and 3D simulations. The beta test phase includes end user testing and feedback. The courseware will be delivered on the desired platform, which can include stand-alone CD-ROM, or other popular Web-based learning management platforms.

3.1.6 Testing

In this phase, it will be done by the end users of the system who will be the teachers and the kids. This will include their reaction to the learning product, measurement of learning through assessments and assessment of kids' performance on the job or performance on a certification test.

3.1.7 Maintenance

Maintenance is one phase included in the development of the "Learning through games" courseware. It involves correcting errors that have gone undetected before, improvement and other forms of support. This phase is part of the life cycle of a courseware, and not of the strict development, although improvements and fixes can still be considered as development.

Throughout the development of this project, the author has first initiated the project by identifying the specifications and requirements of the courseware including the project's objective, scope and tools used in developing the courseware. Then, with the specifications gained, the instructional designer tasks will take part where the storyboard is created according to the suitability of students' interest. The contents and exercises are taken solely from the syllabus in the textbook approved by Ministry of Education of Malaysia. Based on the storyboard, the use of computers to present text, graphics, video, animation and sound are being done in multimedia design phase. The integration of the artwork and instructional design continued in the multimedia development stage. Before the courseware being tested, the content, artwork, design and games are being integrated again to be encapsulating in the courseware. In order to assure the effectiveness and attractiveness of the courseware, the evaluation from the students are required.

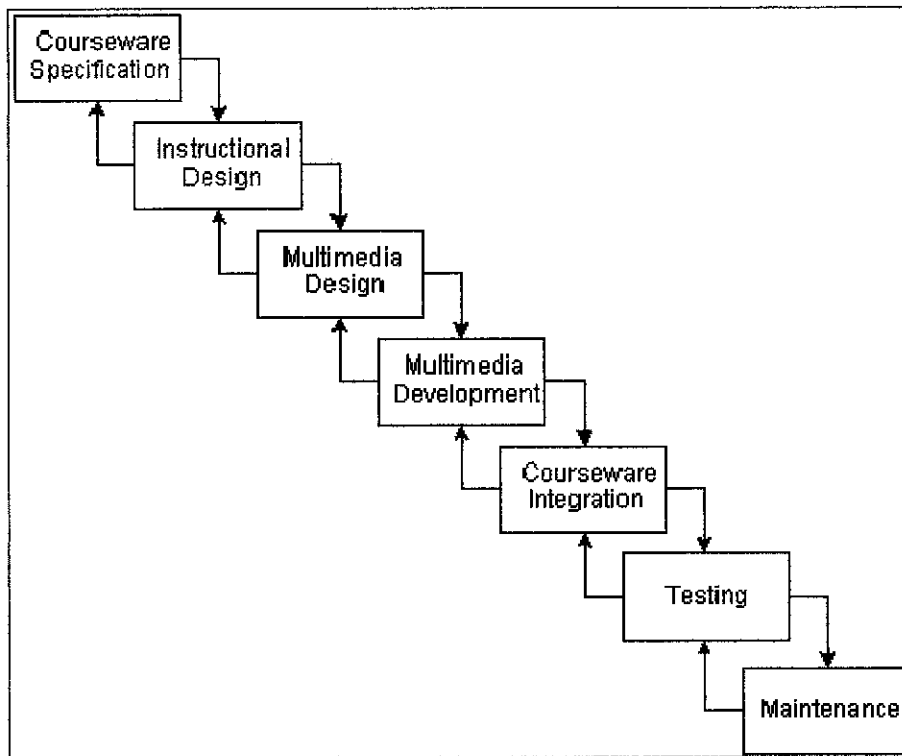


Figure 6: Courseware Development Framework

3.2 Tools Used

As mentioned above, the tools are identified. Based on several stages which include of interactive multimedia application, games elements and graphics design, the tools needs are listed below.

3.2.1 Software Requirement

1) Macromedia Flash MX

This is to create flashy effect of image and animation to provide interactivity in order to grab the user's attention. Flash also is a multimedia authoring program used to create content for it as well as games or movies created using the program. It is a compilation of tool for drawing and animating graphics and designing interactive elements.

2) Adobe Photoshop

Adobe Photoshop is the most popular application for image editing and enhancement. At the same time, Adobe Photoshop is known as best tools in altering the image creation. From Adobe, the author can easily edit and draw the pictures to include in the “Learning through games” courseware.

3) Stagecast Creator

Stagecast Creator is a picture-based programming system. It is based on the "follow my example" programming concept in which logic is illustrated as a series of animations and triggered by certain visual layouts on a global playfield (or "world"). It can be used to construct simple simulations, animations and games, which run under Java on any suitable platform. It is accessible to all academic abilities. In addition, it can be access to more complex features to allow progression and differentiation. In stagecast creator, sims which is the design of the games or simulation can be published online. It depends on the users' availability either to publish it on a CD based or through online.

3.2.2 Hardware Requirement

The list of hardware at least to fulfill this system is as follows:

- ❖ At least 400MHz – 500MHz processor speed recommended
- ❖ 128MB – 256MB RAM recommended
- ❖ 15 – 20GB hard disk space (include Windows and basic software)
- ❖ Sound card
- ❖ Audio devices

CHAPTER 4

RESULTS AND DISCUSSION

This section of the report contains findings related to the subject matter through out the product development process until its completion. By identifying the rationalization of the courseware, a pre-survey has been done to gather data from respective respondent. From the analysis, it shows that students can be engaged and motivated to play computer games. The courseware consists of three (3) parts which include the main page, home page and the sub menu pages. Finally, post-study has been conducted to test the developed courseware from random respondents.

4.1 Pre-study Data Analysis

Based on the literature review, a pre-survey was conducted to identify the interest of students on computer games. In order to do this task, a pre-survey has been done where it takes in Sekolah Kebangsaan Jalan Tiga, Bandar Baru Bangi and Sekolah Kebangsaan Kem Terendak, Melaka. The target subjects for this survey were the primary school students and teacher. For the teacher, an informal interview has been conducted regarding ways of teaching and students' interest towards learning nowadays. For the students, they were given pre-survey questionnaire regarding computer games.

4.1.1 Interview

In order to gather information, some researches methods have been carried out including interviews. From the interview, the data collection is conducted by interviewing En Azhar Ayob, Mathematic teacher from Sekolah Rendah Kebangsaan Kem Terendak, Melaka. He currently is teaching Mathematics for Standard 3 students. The objective of doing so is to determine the differences between the multimedia based applications to the normal classroom in educating the kids and the difficulties in teaching fraction topic through normal teaching way. These interviews

were successfully conducted where the interviewee gave full co-operation during the data collection session.

Based on the interview, nowadays, there is an improvement in class teaching where teachers teach the students using computers for certain courses. The materials used usually taken from the educational CDs provided in the textbook. They will refer to the CDs where the students can see the animated image, sound, moving text and etc instead of static image in the book. From the interview, the interviewee has stated that a fraction is one of the most difficult topics to teach as it requires the students to visualize the objects. Thus, by developing the CDs that include all of the multimedia elements that integrated with the games elements, the engagement of students can be improve. He also has mentioned that the CDs that he is currently using are not attractive enough to engage the students towards learning especially in fraction topic. It means that the CDs only provide the simple questions such as drag and drop, choose the best answer and etc.

4.1.2 Questionnaires

The questionnaire is prepared for the students of learning application in which it is being used to measure the effectiveness of learning through games application. I have distributed the questionnaires to the students of Sekolah Kebangsaan Jalan 3, Bandar Baru Bangi, Selangor. There are 60 primary school students have attempted the questionnaires. From this activity, 100% participants have responded to the questionnaire. I have divided the questionnaires to several age levels with different gender. I distributed to 30 boys and 30 girls students.

4.1.3 Results

As mentioned above, I have divided into four groups according to age level starting from age 9 until 12 and to 30 boys and 30 girls' students. Chart below shows the percentage of the respondents for each group and gender.

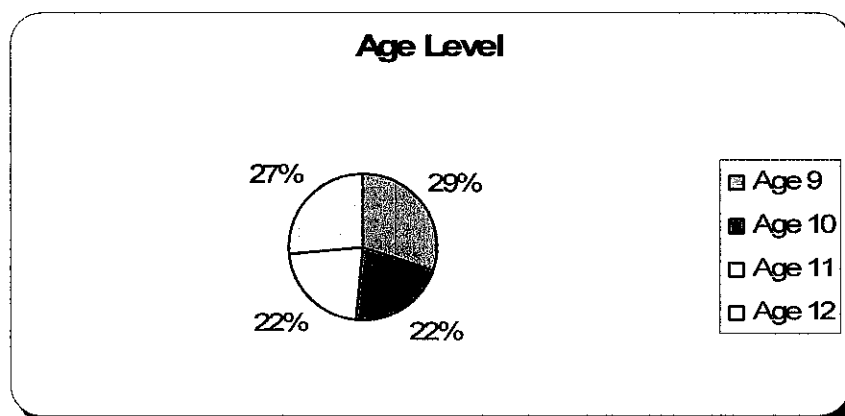


Figure 7: Percentage of respondents according to age

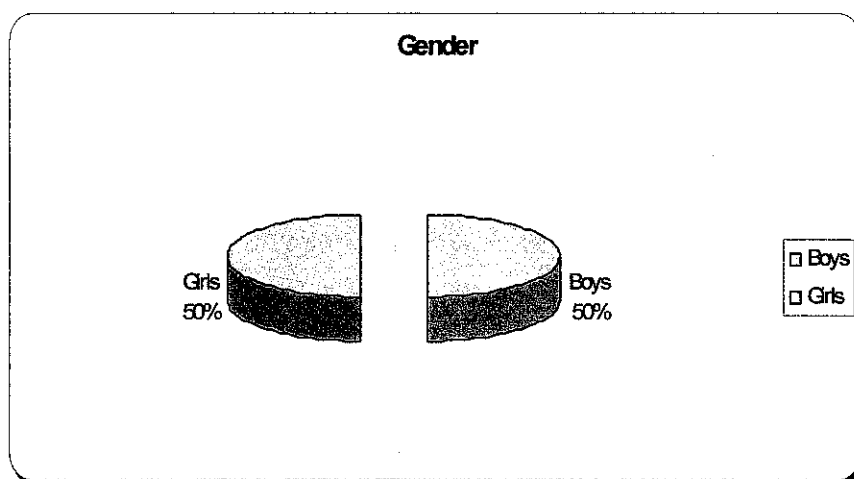


Figure 8: Percentage of respondents according to gender

What do they play?

The most popular games were Counter Strike, Internet games, Super Mario and others which comprises of different kinds of games such as FIFA, Naruto, Solitare and etc. When asked to name their most favourite games students came up with a high variety but most were mentioned only once or twice. The features covered presentation, structure, the nature of the activity or some kind of personal response. At all age level, boys identified a wider range of games than girls. The only clear difference by gender was that the boys at all ages make more frequent reference to some form of fighting, violence and shooting.

Some girls also like fighting in games; as many as 3.5% only. With the advancement of technology, students are more likely to play games on a PC rather than on a game console because most of the games chosen are PC based. In addition, with the percentage of 11.5% for girls on Super Mario game, it slightly more girls than boys reported game consoles use, although it were still more popular with the boys.

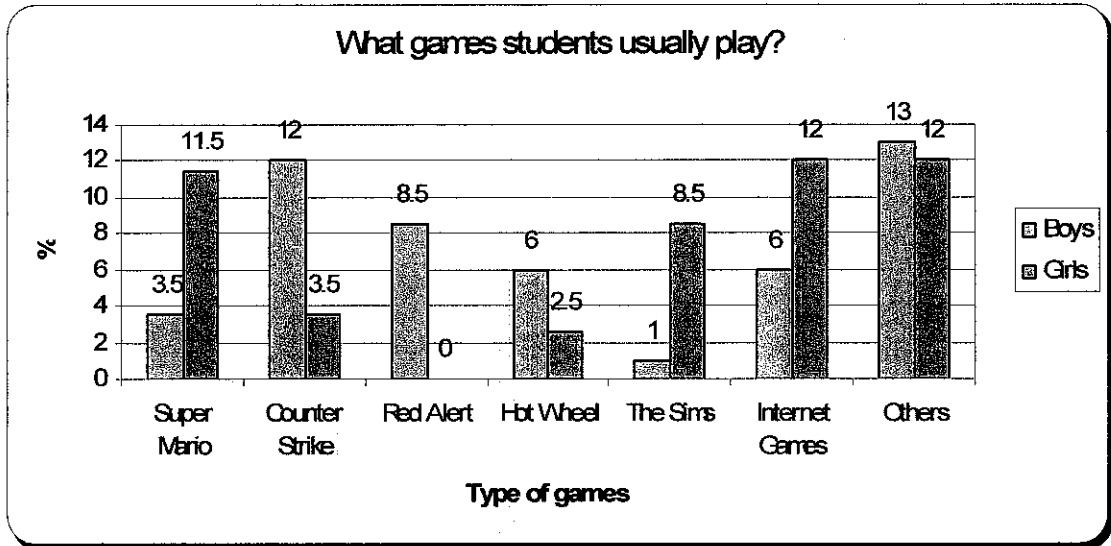


Figure 9: Type of games

Where do they play?

The majority of students play games at home, usually in their rooms. Only a few students report playing at cyber café and very few report playing games at friend's house.

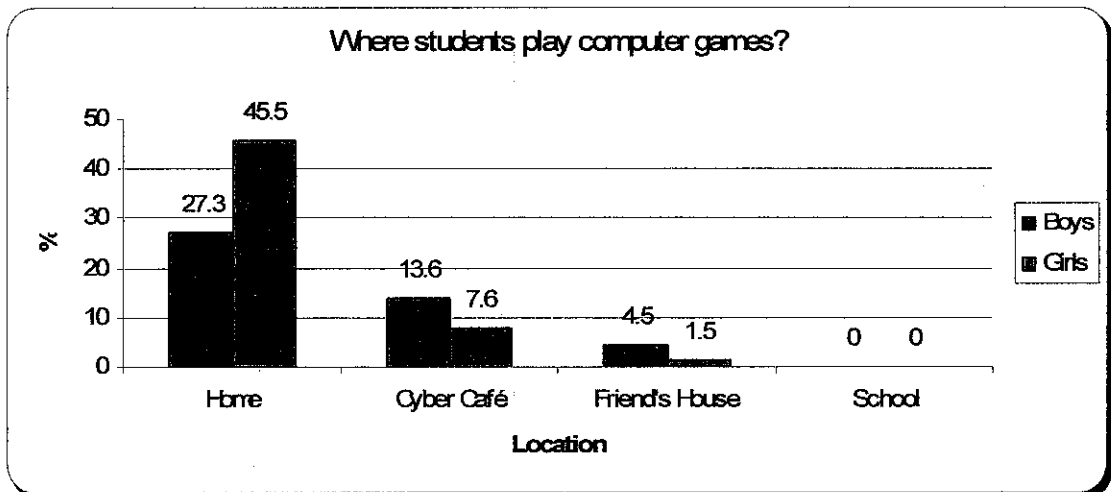


Figure 10: Location of playing games

When do they play?

Not surprisingly games are played at weekends and after school. According to McFarlane and colleagues there is a tendency among girls to play games when they are bored or have nothing more interesting to do, whereas boys are more likely to play games as a first choice activity. These can be seen from the graph below where boys are more likely to play games 3-5 and 6 -10 times per week while girls play games only between 1-2 times per week.

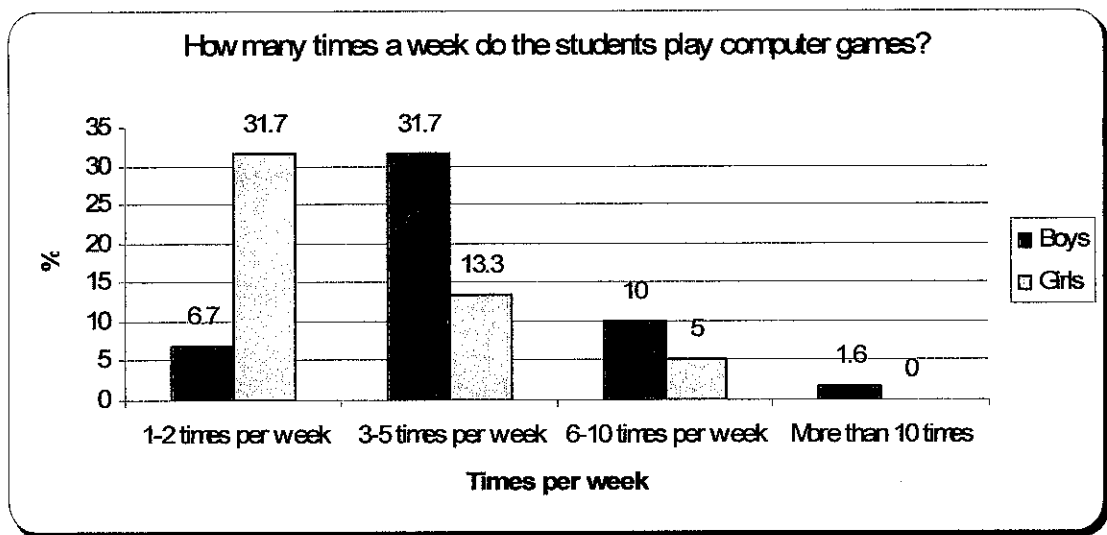


Figure 11: Time per week playing games

How long do they play?

Approximately 38.3% of students reported playing games for up to 2 hours at a time. By 31.7% of girls reported playing up to 1 hour or less, whereas 31.7% of boys were still playing up to 2 hours or more. Overall the patterns for times per week matched those for length of session suggesting that there is a range of engagement which sees less game playing for girls.

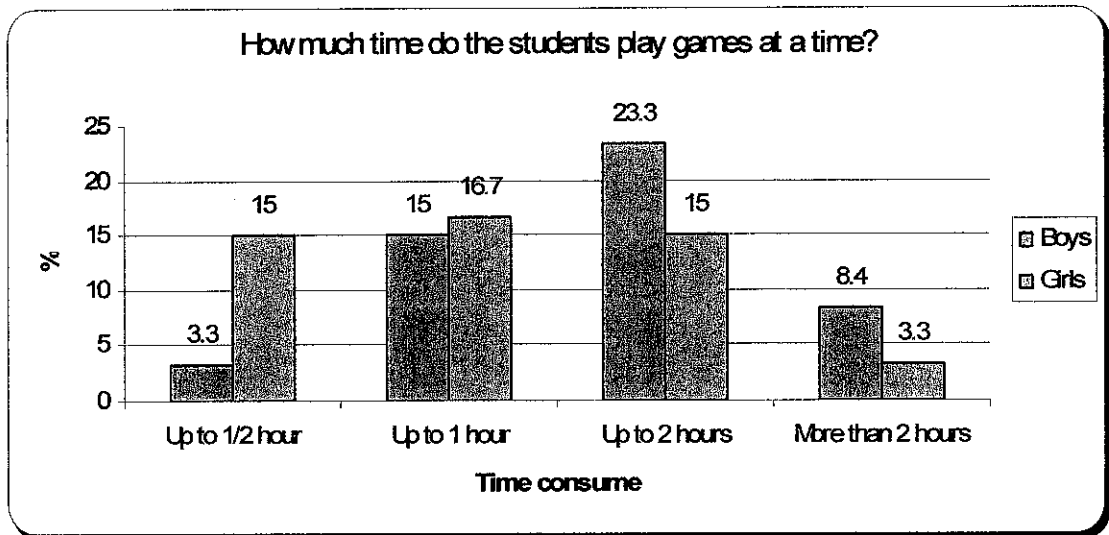


Figure 12: Length of session

Who do they play with?

Overall students are more likely to play games alone or with their brother. They also play with their friends even girls are more likely to play with male family members than a female one.

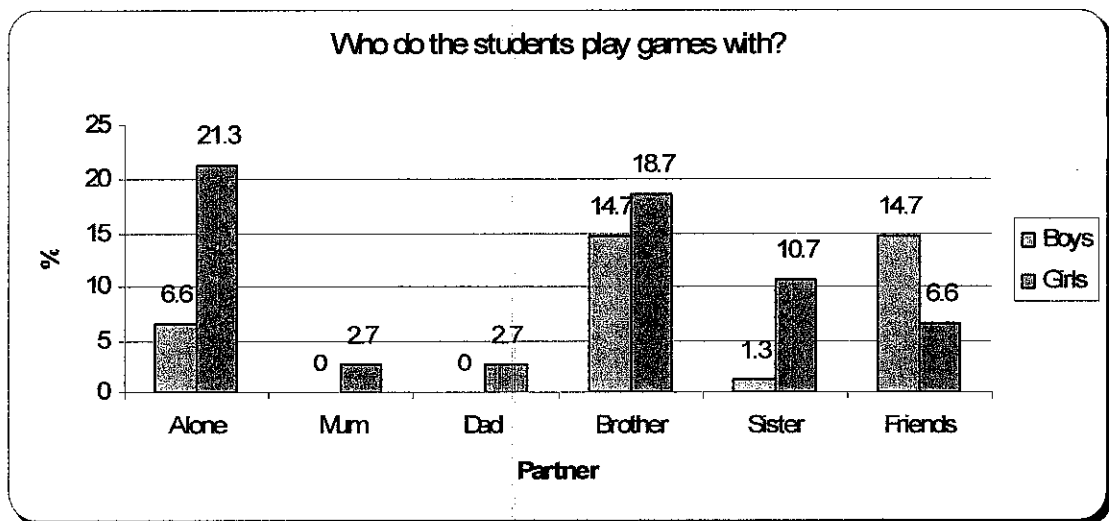


Figure 13: Partner in a session

What do they own?

Students are more likely to own between 1 to 10 games. Surprisingly, girls own more games than boys where about 11.7% of them own more than 20 games while boys only 6.6%. This may be because the games they report in their favourite list are smaller or cheaper product. And also girls are more likely to have a variety of games compared to boys where they will stick to the games that they really enjoy with.

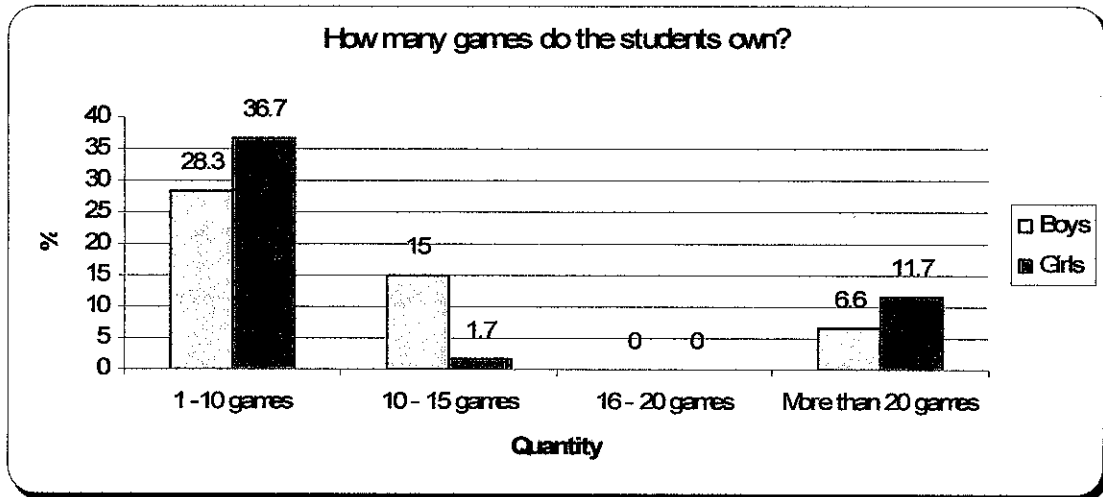


Figure 14: Quantity of games own

Internet access

By means, home access and no internet access has the same percentage. About 38.3% of girls have home access compared to boys which only 13.3%. Thus, it is true that girls like to play internet games compared to boys. This can be seen in the graph in Figure 9 where about 12% of girls play internet games compared to 6% of boys.

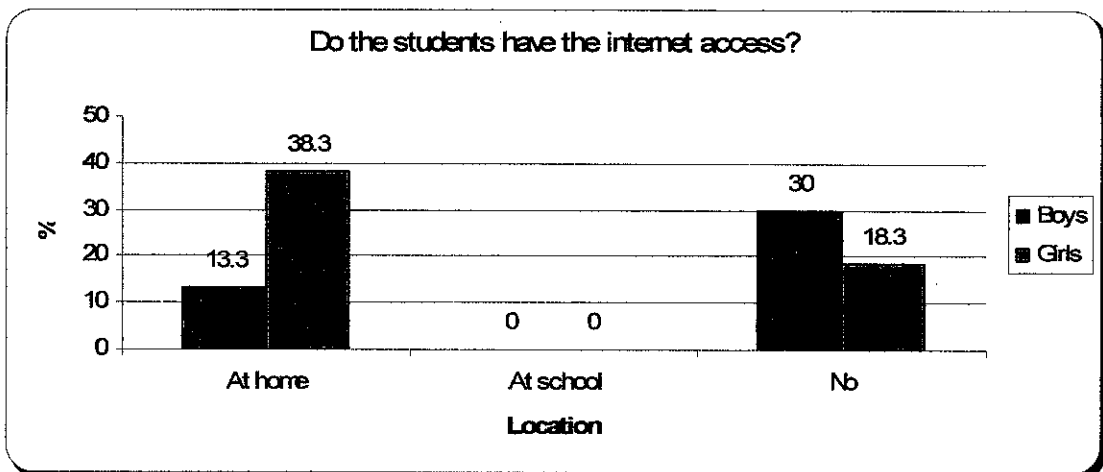


Figure 15: Internet access location

Games at school

When students were asked where do they play the games, school did not feature very frequently at all. However when asked directly if they played games at school the answer were more positive to boys. This probably reflects the fact that boys do play games at school, but nowhere as frequently as at home. None of the girls play games at school while about 30% boys play games at school.

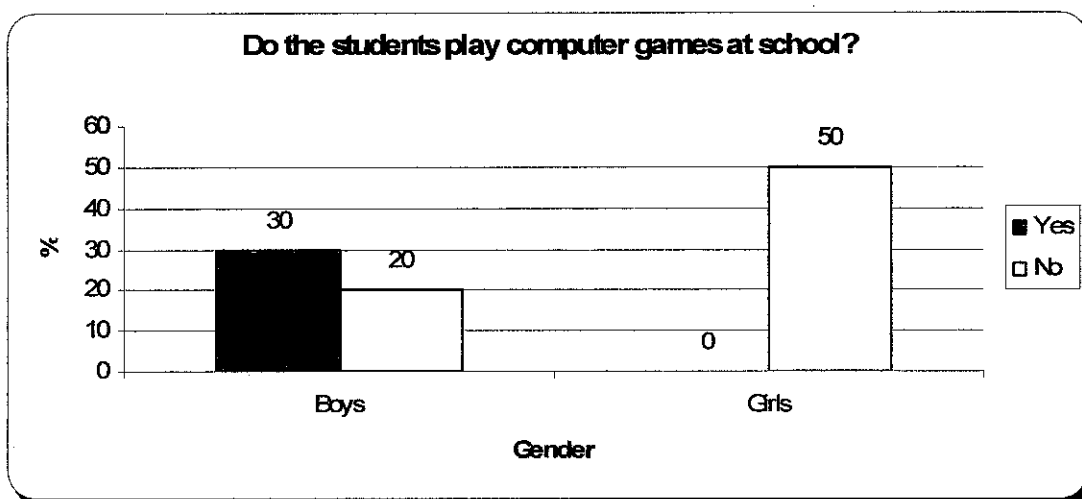


Figure 16: Playing computer games in school

Engagement of games

Most of the students are really committed in playing games because about 43.3% of boys and 36.7% of girls stated that while they are playing games, nobody can interrupt. Only a few students stated yes based on type of games they are playing such as Solitaire, The Sims and Super Mario. Most of them are girls compared to boys which only 6.7%.

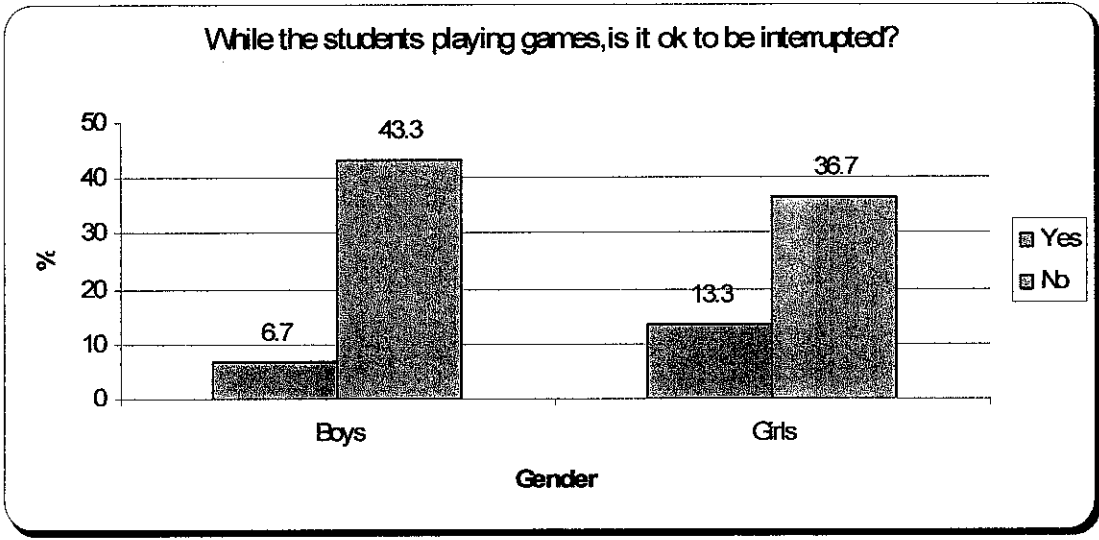


Figure 17: The engagement of games

Educational CDs

When students were asked whether they have tried any educational CDs, about 71.6% students stated yes and 28.4% stated no. This is probably because they are not aware of the CDs provided or they are more interested to learn in traditional way having teachers in classrooms.

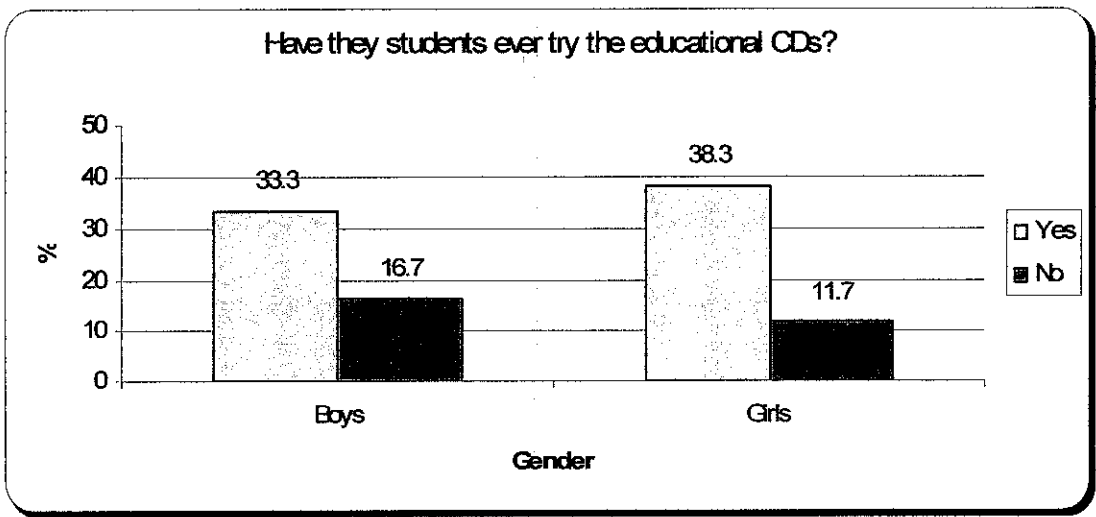


Figure 18: Usage of educational CDs

Feedback on educational CDs

Based on 71.6% of students who have tried the educational CDs, most of them especially boys stated that they are more likely boring with the CDs compared to girls where most of them stated that the CDs are in an average range. Moreover, it seems that the percentage of girls comments on attractive and very entertaining range is quite high. It shows that girls are easily engaged to the educational CDs provided in the textbook compared to boys.

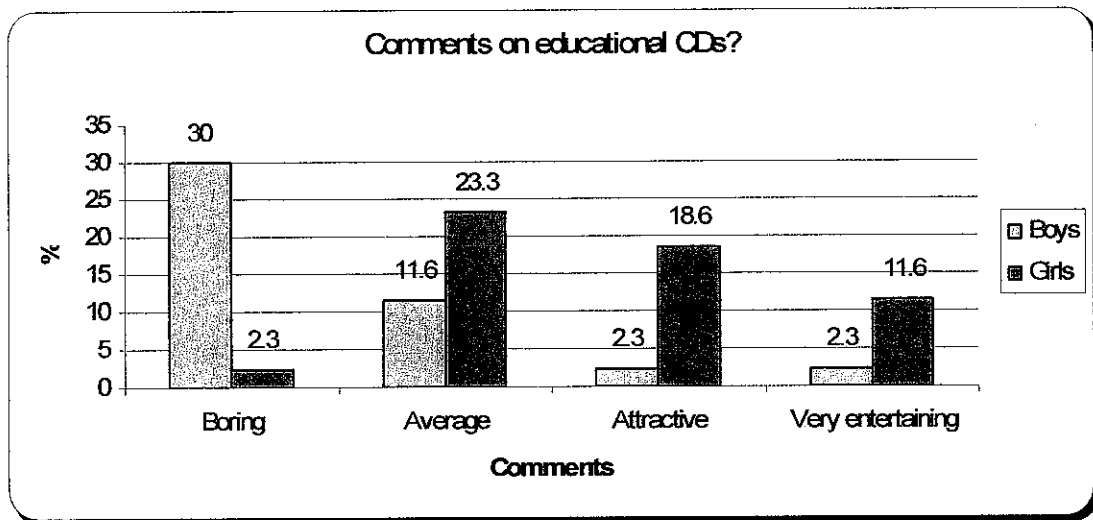


Figure 19: Feedback on educational CDs

4.1.4 Discussions

It is clear from the results that whilst the teachers and students have a traditional view of the material learnt in school, they also recognize that there are additional areas of knowledge that kids need to acquire, and that some of these are directly related to the computer and others do not. There is a widely held view that games software is capable of developing a degree of user engagement which could be usefully connected in an educational context. Most of the respondents stated that there are prefer edutainment activities which are structured with a view of loosely supporting education, usually a combination of activities and games with a clearly educational objective. It can range from skill development eg. hand eye coordination, concentration, memory, problem solving or creation of an outcome based on the

content provided. From the results also, it has been discovered that learning through games methods are suitable for primary school students, combination of animation, image, text, voice and games in the courseware are preferred.

Based on the questionnaires, both boys and girls enjoy computer games and even though they play at their home they often play with a friend or family member. The games the students prefer and which keep their attention are those which offer an appropriate level of challenge and multiple levels so that they can make progress. Generally, although arcade style games are common, adventure and race games are also very popular. Computer games are a more embedded part of boy's leisure culture than that of girls. In addition, by referring to the results from the questionnaires, it seem like boys view game playing as a first choice activity, whereas girls are more likely to play when they are bored or have nothing better to do.

4.2 Product Development

The final product of this project consists of three (3) parts which include:

1. Main page
2. Home page
3. Sub Menu Page - Notes
 - Exercises
 - Games

Each of pages has purposes that described as below.

4.2.1 The Main page

The first page of the courseware is the main page which consists of the montage of the course. The bottom side of the page provides the button where once the users click on the “Click here to play!”, it linked the page to the home page which provided the list of the section. The word “Fractions”, butterflies and star are animated.



Figure 20: Screen Shot - Main page

4.2.2 Home Page

The sub menu page is provides the list of the section provided. The page is the continuous of the main page once user clicked on the button link in the main page. The courseware has been divided into 5 sections comprises of notes, exercises, adventure, help and quit. On the notes part, it will link to the page where basic information on fractions is designed in order to give ideas to users. Some of the objects in the left side are animated. For exercises, it will link to three choices of level starting from level 1 to 3. While for adventure section, it linked to the exercises where the users will be brought to the world of games.

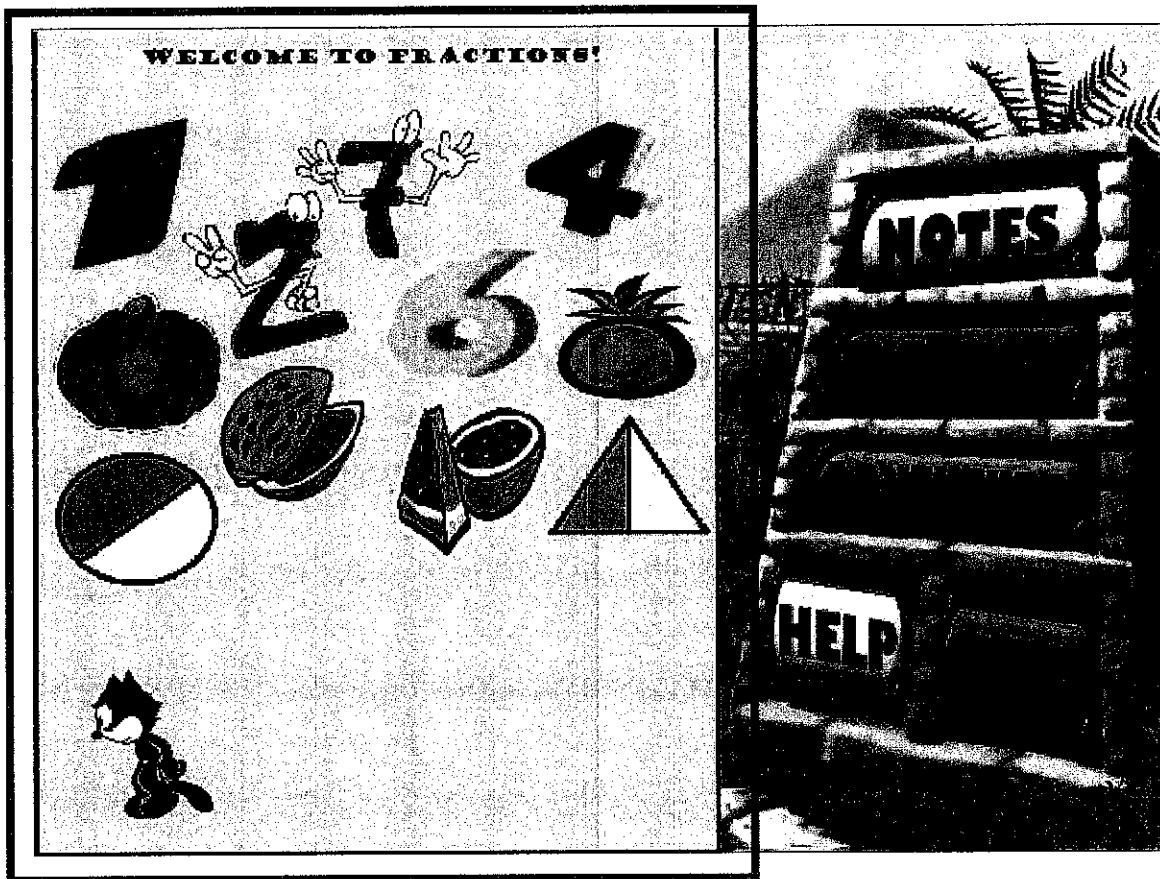


Figure 21: Screen Shot - Homepage

4.2.3 Sub Menu Page

4.2.3.1 Notes section

The notes section is to give students an overview on fraction topics. For this courseware, the basic information is being taken from the syllabus of standard three primary school students. Below shows the sample of notes page developed.

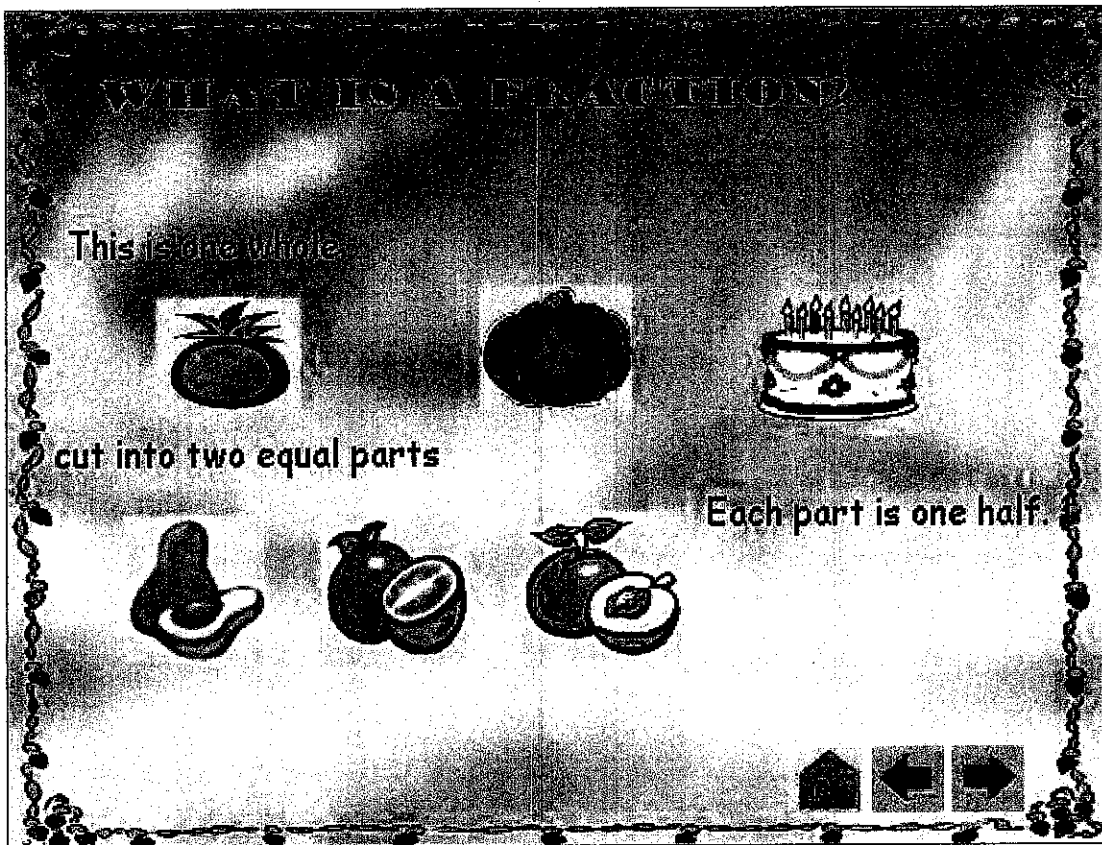


Figure 22: Screen Shot – Notes Page

4.2.3.2 Exercises section

Below is an overview of the exercises page. It has been divided into 3 levels where in each level there are 7 questions comprises of drag and drop exercise, fill in the blanks, choose the best answer, and etc. The difficulty of each level is different. By clicking the “>” button, the questions is started.

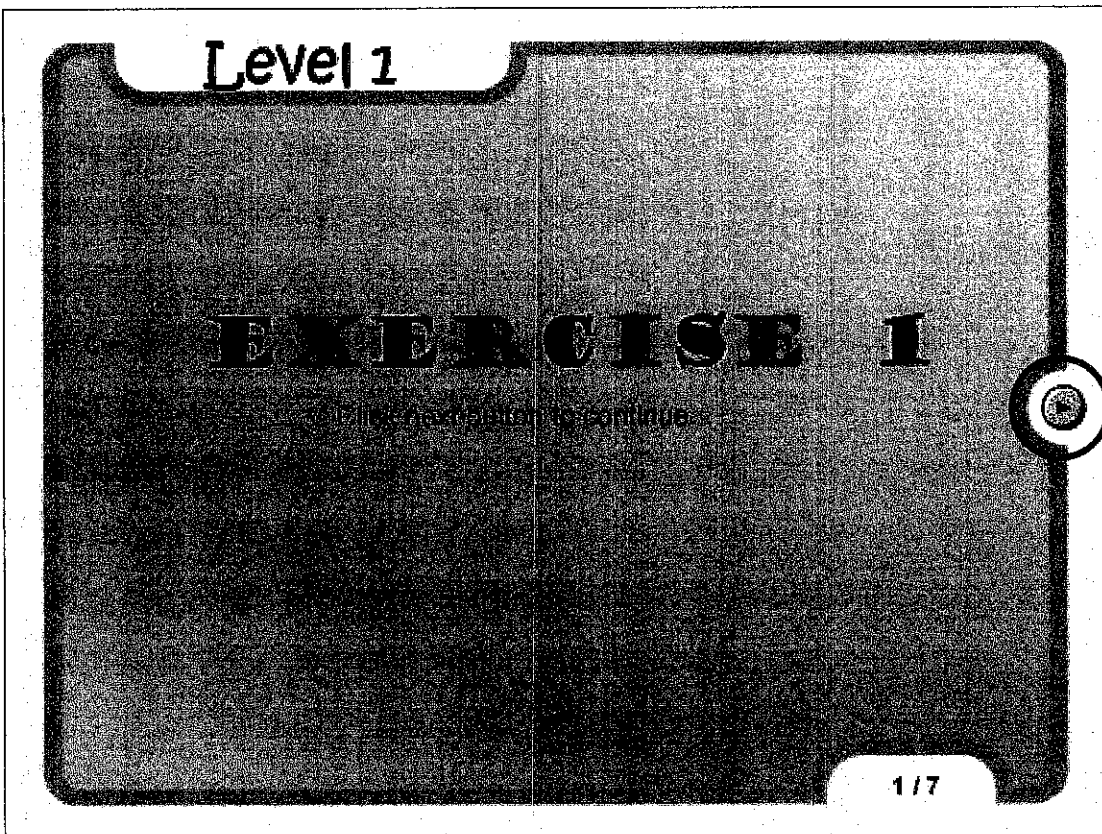


Figure 23: Screen Shot - Level 1 Page

4.2.3 Games section

In this courseware, the author has developed 3 levels of games. Below is sample of game for one of the level designed for adventure section. The adventure section has been divided into three levels. In order to reach to the top level, they have to get keys or clues for each level of games. Screen below shows a game that requires students to interact by using keyboard keys. In order for the 'robin' to open the door, he has to take the key and shoot the soldiers. The keyboard keys used for this game are:

- ↑ Move forward
- ↓ Move backward
- Move to the right
- ← Move to the left

'Space bar' To release the archery to the soldiers

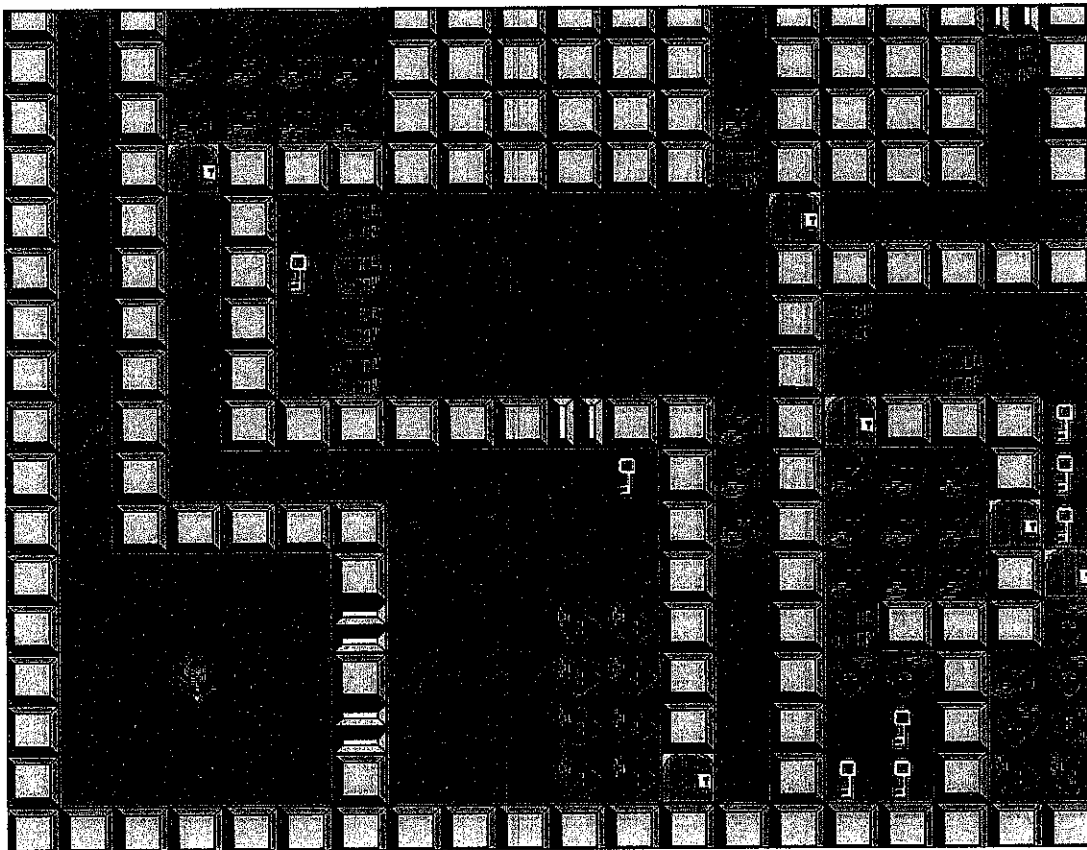


Figure 24: Games Page

4.3 Post-study Analysis

Based on the courseware developed, a survey was conducted to test the reaction of students towards product. In order to do this task, a post-survey has been done to random respondents includes the primary school students. They were given post-survey questionnaire regarding the attractiveness and materials integrated.

4.3.1 Questionnaires

Some of the data gathered for this project was from the questionnaires that have been distributed to group of kids and their representative includes their sisters and brothers. This questionnaire is to assist in evaluating the effective usage of navigation, icons, images, narrations as well as the motivation in learning the courseware. It will serve as a guidance to determine the level of students understanding and engagement after using the courseware.

4.3.2 Results

As mentioned above, I have distributed the questionnaires to the kids and their representatives involve their family members. Chart below shows the percentage of responds as summarize for each section.

Section A: Learning Material

For question 1, most of the respondents stated that the information provided in the courseware is in an average amount. They also have responded that the information delivered is understandable to them and they can easily follow the instructions. Chart in the next page shows the percentage of respondents on the information provided.

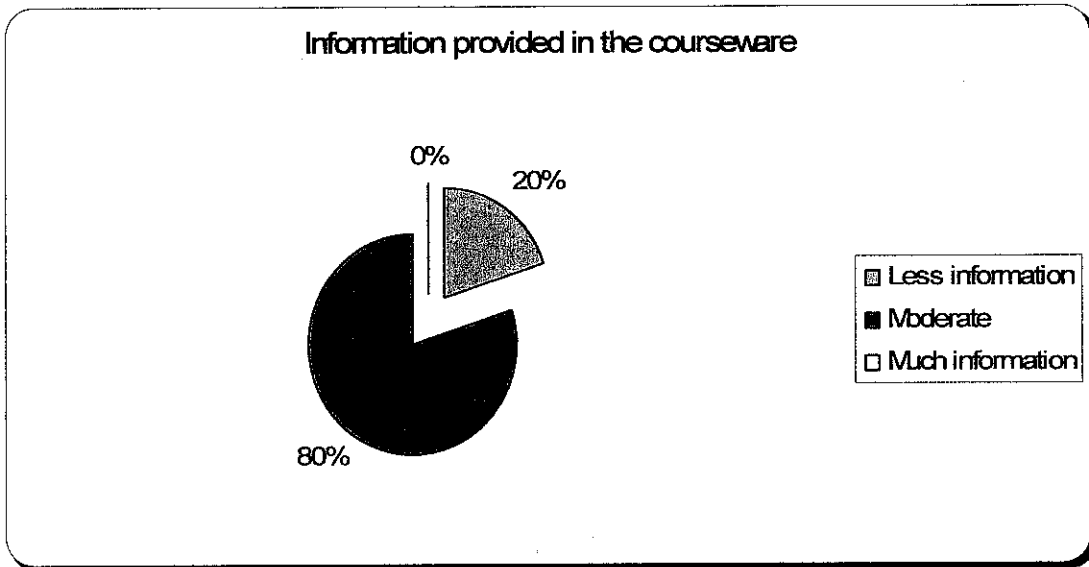


Figure 25: Information provided

Section B: Text

In this section, there are two questions that covered the appropriateness of the text color, size and the arrangement of it in the courseware. The text elements in the courseware are pleasing enough to most of the respondents. Chart below shows the percentage of users on the text color and size used.

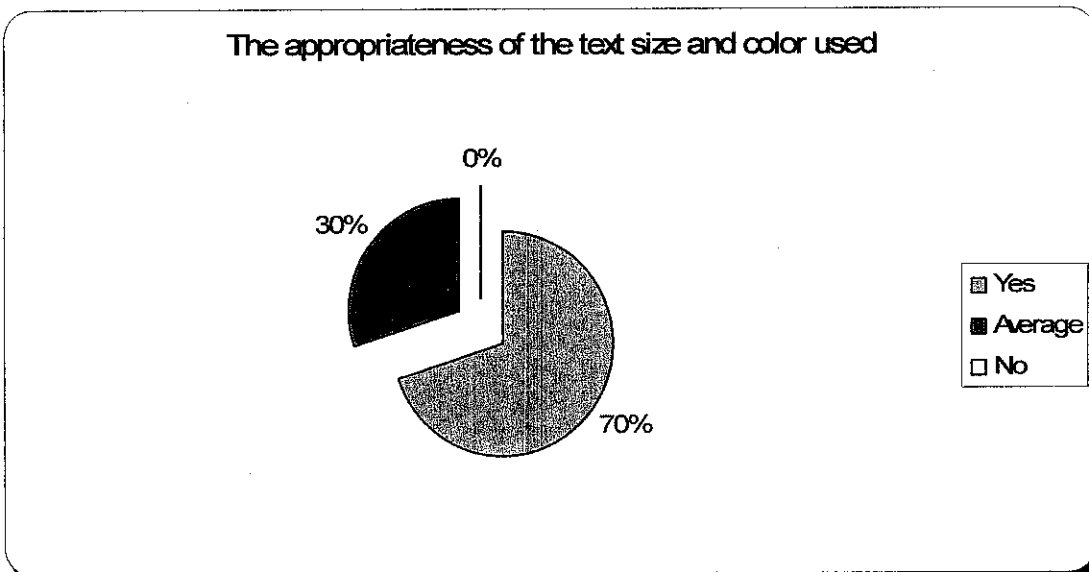


Figure 26: The appropriateness of the text size and color used

Section C: Screen and Navigation

There are three questions resided in this section that covered the background color, sequence and overall design of the screen. The background color of the screen is appealing enough to most of the respondents. The author have designed it by using the bright color which is the combination of orange and light yellow as a background color for most area of the screen. For the sequence of the screen, most of the respondents stated that it is not confusing as they can understand the flow of the screen. On the overall design, the percentage of responds is shown below.

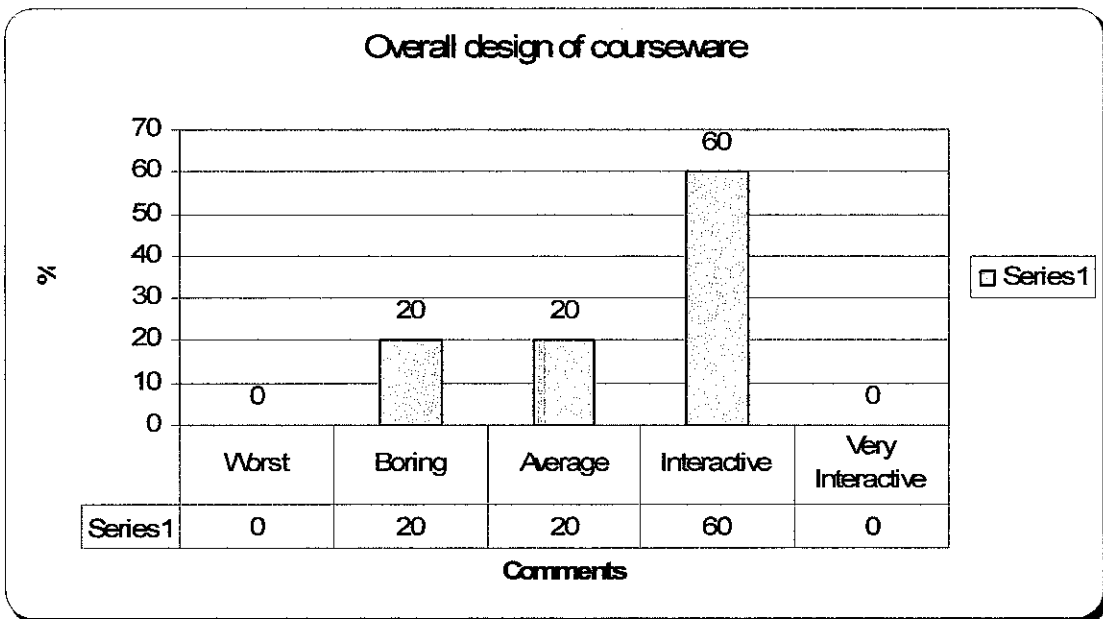


Figure 27: Overall design of the courseware

Section D: Animation, Image and Icon

In this section, there are three questions covered the appropriateness of the animation, image and icon used. The questions also covered the interactivity of the screen and whether they are motivated in learning by using the courseware. For the animation, icons and image used, 100% respondents are pleased on it. On the interactivity and the motivation, it is on the average condition where the designer needs to add more

animations, exercises and challenging games on the courseware. Chart below shows the percentage of the respondents.

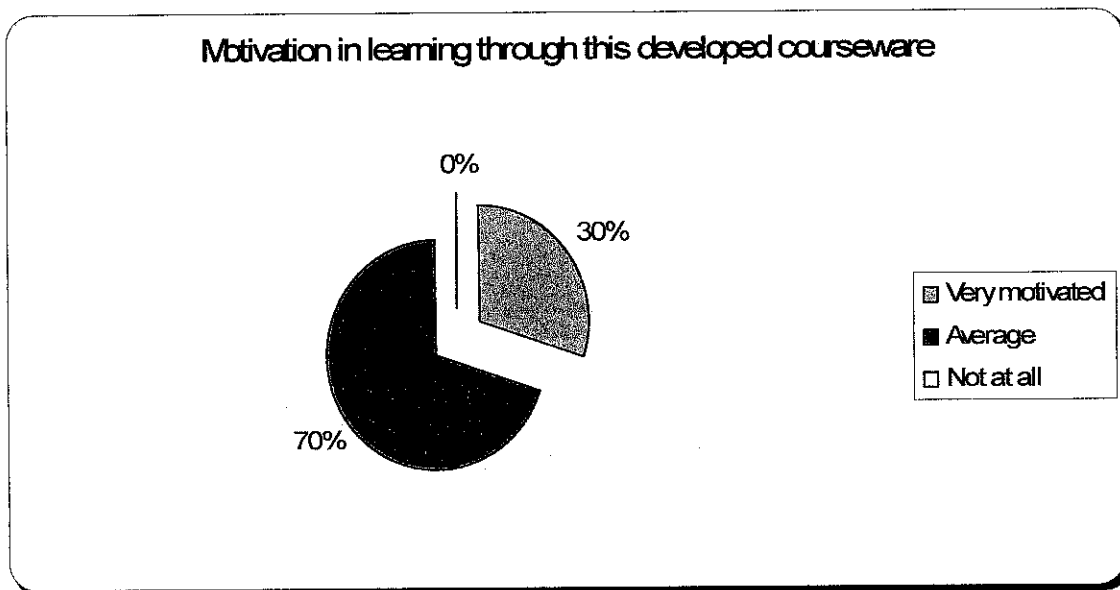


Figure 28: Motivation towards learning

4.3.3 Discussion

It is clear from the result that most of the respondents are pleased and satisfied with the text, color, size, navigation and screen. While for the learning material, animations and challenging games, it has to be added more in the courseware. However, most of the respondents were eager to finish up playing the games while learning throughout the courseware. In addition, some of the respondents said that they never played a game in educational courseware at school. Thus, with the existing of the courseware that integrated with games, they will be motivated and engage to learn the subjects in school. The teachers also will use the CDs as their learning aid in teaching to students.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

This chapter discussed on the conclusion over the project. It will determine the relevancy of the project completed with the objectives expected to achieve. This project might have several limitations which by having the recommendation, the project could be maintained and improve in the future. Both conclusion and recommendation has been discussed below.

5.1 Conclusion

Various changes occur that influence the content in the teaching of mathematics in primary schools. These changes require variety in the way of teaching mathematics in school. The use of teaching resources is vital in forming mathematical concepts that will ensure the students absorb abstract ideas, be creative, feel confident and be able to work independently or in groups. Most of these resources are designed for self - access learning. Through self – access learning, students will be able to access knowledge or skills and information independently according to their pace. This will serve to stimulate student's interest and responsibility in learning mathematics.

Based on the pre-study through interview and questionnaires, it indicates that most of the kids like to play games as their first choice activity when they have free time. The games where kids prefer and which keep their attention are those which offer an appropriate level of challenge and multiple levels so that they can make progress. Then with the development of the integrated system, the engagement and motivation of kids to learn through courseware can be improve. While for post-study done through questionnaires, students can slowly accept the integration of it in the courseware.

Any game typology reveals that some types of games are more fit to education than others. Several studies have proposed a game typology or arrangement, using different perspectives to do so, but most of them use the game characteristics as their main starting point. They look at games from the inside: what are games about or how do they function. The criterion the author use to distinguish types of games here is directly linked to the function of the game in the overall concept of the educational software. The higher the level of the games, the complex it is. Simple games have little complexity while complex games provide a sophisticated mixture of difficult challenges that typically link and support each other. Complex games often have one or several simple games embedded within them for specific learning purposes.

5.2 Recommendations

The multimedia courseware produced at the end of the project basically focus on the topic of fraction for primary school students. The author would like to make few recommendations for the project to spawn further improvements.

1. For the prototype, it is suggested to have more chapters in the future enhancement not only focusing on function chapter. Also, the feature could be upgraded by trying to include more graphical interface to enhance the usability of this courseware.
2. The multimedia authoring tool used to create the courseware is Macromedia Flash MX Professional 2004 (.swf) can be embedded in Hypertext Markup Language (HTML), it is recommended that the courseware be made available online. However, several factors need to be considered, especially the downloading time. Here, the author would like to propose the use of sound to be minimized, as it increased file size. Then again, research must be conducted to determine how it affects the learning process.
3. The author proposes to increase the number of assessment available in the courseware as it serves to better gauge students' understanding on the subject matter.
4. It is recommended to provide multiple languages in the courseware such as Bahasa Melayu and Chinese to enhance the literacy of the students.
5. Ability to send data to printer is one of the ways to enhance the courseware. The students would be more interested in the learning because they can learn and have fun from the view of colourful images on monitor as well as on paper. By printing their work or scores they can show it to others.

The distinction between whether a game is a simple game or a complex game solely based on how many hours it takes to complete or master that game. Simple games take 2 hours or less while complex games take about 6-8 hours or more. Thus, the evaluation needs to be done in longer time. In addition, more research will be done in this area in later time to add new ideas in designing the content for “Learning through games” courseware. The author shall ensure that ideas can be integrate into the exact courseware to come out with an interactive and interesting courseware by the end of the study.

REFERENCES

1. Alice Mitchell and Carol Savill-Smith, 2004, "The use of computer and video games for learning", a review of the literature.
2. John Kirriemuir, Ceangal Angela McFarlane 2002, "Literature review in Games and Learning".
3. Lloyd P. Rieber, "Multimedia Learning in Games, Simulations and Microworlds".
4. Professor Angela McFarlane, Anne Sparrowhawk, Ysanne Heald, "Report on the educational use of games".
5. Marc Prensky, 2005, "In Educational Games, Complexity Matters".
6. Marshall G Jones, "Creating engagement in Computer-Based Learning Environments".
7. Graeme Daniel, 2005, "Computer Games for Learning".
8. Begona Gros, "The impact of digital games in education".
9. http://en.wikipedia.org/wiki/Adobe_Photoshop
10. www.3dsolve.com/methodology.html
11. www.stagecastcreator.com/tutorial

APPENDICES

APPENDIX I: PROJECT TIMELINE

- **Gantt Chart**

ID	Task Name	Start	Finish	Durat on	Feb 2006		Mar 2006		Apr 2006		May 2006		Jun 2006		Jul 2006		Aug 2006		Sep 2006		Oct 2006													
					2/12	2/19	2/26	3/6	3/12	3/19	3/26	4/2	4/9	4/16	4/23	4/30	5/7	5/14	5/21	5/28	6/4	6/11	6/18	6/25	7/2	7/9	7/16	7/23	7/30	8/6	8/13	8/20	8/27	9/3
1	COURSEWARE SPECIFICATION	2/13/2006	2/28/2006	2.4w																														
2	Project Initiation	2/13/2006	2/17/2006	1w																														
3	Project Proposal	2/20/2006	2/24/2006	1w																														
4	Task Identification & Time Estimation	2/27/2006	2/28/2006	.4w																														
5	Information gathering	2/13/2006	2/13/2006	.2w																														
6	INSTRUCTIONAL DESIGN	3/1/2006	3/24/2006	3.6w																														
7	Analysis Strategy Problem Analysis	3/1/2006	3/6/2006	.8w																														
8	Courseware Analysis	3/13/2006	3/15/2006	.6w																														
9	Storyboard and storyline	3/15/2006	3/24/2006	1.9w																														
10	MULTIMEDIA DESIGN	3/27/2006	5/5/2006	6w																														
11	Courseware Design	3/27/2006	5/5/2006	6w																														
12	MULTIMEDIA DEVELOPMENT	5/8/2006	6/30/2006	8w																														
13	Integration of artwork + ID	5/8/2006	6/30/2006	8w																														
14	COURSEWARE INTEGRATION	7/3/2006	8/4/2006	5w																														
15	Beta Version	7/3/2006	7/14/2006	2w																														
16	Beta Testing	7/17/2006	7/28/2006	2w																														
17	Desired Platform	7/31/2006	8/4/2006	1w																														
18	TESTING	8/7/2006	9/1/2006	4w																														
19	Assessment of Kids' Performance	8/7/2006	8/18/2006	2w																														
20	Certification testing	8/21/2006	9/1/2006	2w																														
21	MAINTENANCE	9/4/2006	10/20/2006	7w																														
22	Final Draft	9/4/2006	9/4/2006	0w																														
23	Correcting Errors	9/18/2006	9/22/2006	1w																														
24	Final Report	9/25/2006	9/25/2006	.2w																														
25	Exhibition	10/11/2006	10/12/2006	.4w																														
26	Project Work	10/11/2006	10/12/2006	.4w																														
27	Oral Presentation & Pre EDX	10/11/2006	10/12/2006	.4w																														
28	Dissertation	10/16/2006	10/20/2006	1w																														

APPENDIX II: RESULTS AND FINDINGS

- Pre-survey Questionnaire
- Post-study Questionnaire

Final Year Project Questionnaire
Survey on the Usage of Computer among Primary School Students

Instruction

Please tick [X] in the box given.

Age :

Gender:

	Male
	Female

1) What game(s) do you normally play?

	Super Mario
	Counter Strike
	Red Alert
	Hot Wheel
	The Sims
	Internet Games

Others: _____

2) Where do you play games?

	Home
	Cyber Café
	Friend's house
	School

3) How many times a week do you play computer games?

	1 - 2 times per week
	3 - 5 times per week
	6 - 10 times per week
	More than 10 times
	Please specify: _____

4) How much time do you play games at a time?

	Up to ½ hour
	Up to 1 hour
	Up to 2 hour
	More than 2 hours
	Please specify: _____

5) Who do you play games with?

<input type="checkbox"/>	Alone
<input type="checkbox"/>	Mum
<input type="checkbox"/>	Dad
<input type="checkbox"/>	Brother
<input type="checkbox"/>	Sister
<input type="checkbox"/>	Friends

6) How many games do you own?

<input type="checkbox"/>	1 – 10
<input type="checkbox"/>	10 – 15
<input type="checkbox"/>	16 – 20
<input type="checkbox"/>	More than 20

7) Do you have internet access?

<input type="checkbox"/>	At home
<input type="checkbox"/>	At school
<input type="checkbox"/>	No

8) Do you play computer games at school?

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

9) While you were playing the games, is it OK with you to be interrupted?

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

10) If yes, what type of games?

Please specify: _____

11) Have you ever try any educational CDs?

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

12) If yes, what do you think of the CD and the engagement towards learning?

<input type="checkbox"/>	Boring	<input type="checkbox"/>	Average	<input type="checkbox"/>	Attractive	<input type="checkbox"/>	Very entertaining
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QUESTIONNAIRE – Post Study

This questionnaire is to assist in evaluating the effective usage of navigation, icons, images as well as the narrations within the courseware. It will serve as a guidance to determine the level of students understanding and engagement after using the courseware.

Instruction: Please tick one for each inquiry.

Section A: Learning Material

1. How do you find the courseware provide you with the information on fraction?

<input type="checkbox"/>	Less Information
<input type="checkbox"/>	Moderate
<input type="checkbox"/>	Much Information

2. Is the information delivered understandable to you?

<input type="checkbox"/>	Yes
<input type="checkbox"/>	Average
<input type="checkbox"/>	No

3. Can you follow the instruction in the courseware properly?

<input type="checkbox"/>	Yes
<input type="checkbox"/>	Average
<input type="checkbox"/>	No

Section B: Text

1. Do you think that the text color and size used is appropriate?

<input type="checkbox"/>	Yes
<input type="checkbox"/>	Average
<input type="checkbox"/>	No

2. Do you think the arrangement of the text displayed is well structured?

<input type="checkbox"/>	Yes
<input type="checkbox"/>	Average
<input type="checkbox"/>	No

Section C: Screen and Navigation

1. Do you think the background color is pleasant?

	Yes
	Average
	No

2. How do you feel on the sequence of the screen? Is it confusing?

	Yes
	Average
	No

3. How you can rate the overall design of the courseware?

Worst	Boring	Average	Interactive	Very Interactive

Section D: Animation, Image and Icon

1. Do you think the animation, image and icons used in the courseware are appropriate?

	Yes
	Average
	No

2. How do you find the courseware interactivity?

	Less Interactive
	Moderate
	Very Interactive

3. Are you motivated to learn fraction through this courseware?

	Very motivated
	Average
	Not at all