

Using Abacus in Teaching Mathematic

(Abacus Mathematic Courseware)

By

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**Dissertation submitted in partial fulfillment of
the requirement for the
Bachelor of Technology (Hons)
(Business Information System)**

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CERTIFICATION OF APPROVAL

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**A project dissertation submitted to the
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(BUSINESS INFORMATION SYSTEM)**

Approved by,



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TRONOH, PERAK

July 2009

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 references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.



(NURUL HIDYAHAINY BINTI ABD WAHID)

ABSTRACT

The purpose of this project is to design and develop a Mathematics courseware in teaching Mathematics. The scope of this courseware is on the special tool which is Abacus. The courseware should represent simple arithmetic operations which are addition and subtraction. Target users for this courseware are children from pre-school to standard 2 (6-8 years old) and beginners and learners of Abacus. It is an aid of introduction in learning Mathematics. This project discusses few problems such as people mindset saying that learning process only occur in a classroom, manual learning system - book is bored and children perception on Mathematics. The courseware is been develop using Prototyping-based methodology where it performs 3 phases concurrently which are Analysis, Design and Implementation until the system is completed. The research instrument was in the form of a questionnaire to gather data to fulfill the courseware requirements.

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To all the lecturers in CIS Department, thank you for assisting me in completing my project. Not to forget the teachers and students of S.K St. Mary, S.K Selayang Jaya and Arithmetic Learning Center.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Mathematic is a study between numbers and other measurable quantities (Wikipedia, 2009). It is one of the most popular subjects been teaches all around the world. However, there are a lot of issues and problems regarding Mathematics. One of the main problems is to attract young children to love learning Mathematics. The use of multimedia and other Information Technology tools are one of the most demanded learning styles in school nowadays.

Therefore, the author develops a courseware that can perform basic mathematical operations such as additional and subtraction to help the young children. The courseware is used to attract children from pre-school to standard 2 (6-8 years old) and also for beginners that are learning Abacus to have fun and enjoy themselves in learning Mathematics. Besides studying at school, children can now studies anywhere because this courseware can easily been access at anytime (in assumption that there is a computer).

By using different teaching approach which is courseware; student at the same time get closer to technology because they are using computer for their learning process. Different methods in teaching may help students to improve their performance in learning process. Simultaneously, the courseware consists of special tool which is Abacus. Nowadays, most school in Malaysia teaches Abacus at Standard 1 student. With a basic understanding of Abacus, students are able to use this courseware. There are also exercises given to make sure that students understand well and enjoy what they have learned.

1.2 PROBLEM STATEMENT

This courseware will be developed in hope that the problem will be solved or at least helps in solving or improving the current problems.

People Mindset

Over the past few decades, there are many learning theories been enhanced to cope with the current learning process, but most of it have been predicated on assumption that learning process only occurs in a classroom, at school with a teacher as a trained instructor (Sharpless, 2005). These are the mindset of people nowadays when they were asked about learning process.

However, with current technology, the learning experience is extensible not only in class, but also at home. By developing a courseware, it is useful as an extra class at home.

Books = bored

In Malaysia, most of the current learning process is using manual system which includes books and teachers. It cannot maintain student interest in learning because most students nowadays are more interested if they can explore and discover the learning material themselves.

By developing a courseware as an alternative learning process, student can have more time to understand what they have learned and therefore help students to improve their performance in learning Mathematics. Courseware also helps teachers to have different teaching methods to maintain the student attention in classroom.

Children perceptions

Children always find that Mathematic is a difficult subject. Based on a study, it shows that 68% of children are highly afraid of Mathematics (Mantra, 2005). It been illustrated in a chart below.

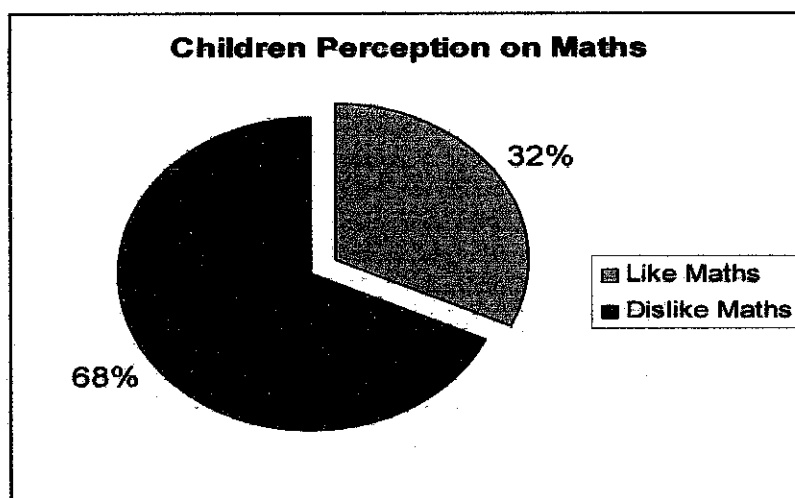


Figure 1.1: Children Perceptions on Mathematics

This is because, introduction to Mathematics make them feel that it is difficult. Therefore, good first impression is important to attract young children and change their perspective saying that Mathematics is interesting.

1.3 OBJECTIVES

- (i) To study on the suitable learning method to be applied in the project.
- (ii) To develop a Mathematic courseware in teaching addition and subtraction that includes special Mathematic tool which is Abacus.

1.4 SCOPE OF STUDY

The scope of the project is mainly concerns about the proper teaching and learning approach to young children in learning Mathematics which is courseware. Rather than teaching Mathematic using games, video and etcetera, this courseware is different because it includes a special Mathematic tool which is Abacus.

Study also consists of basic Mathematical operations which are Addition and Subtraction. It focuses more on the introduction to Mathematics so that it will create interest in young children to love learning Mathematics.

The courseware is used to attract the children to have fun and enjoy themselves in learning Mathematics. Target users for this courseware are:

- Young children age 6-8 years old.
- Beginners and learners of Abacus.

CHAPTER 2

LITERATURE REVIEW

2.1 LEARNING APPROACH

There are various type of learning approach been implemented in schools now a days. People do not rely on only books but also have looking forward to use other interesting methods in teaching and learning process.

2.1.1 Traditional Methods of learning

Normal learning methods in schools are mainly included text and classroom (Galvao, 2005). This traditional methods source of knowledge usually comes from written text such as books and verbally from the teachers. Based on research done by (Motah, 2007) teachers perceptions on the most appropriate teaching methods is in the classroom (talk and chalk method), then demonstrations to the students, followed by discovery, group discussion among peers, observation and lastly the research work. It been illustrated in the following graph.

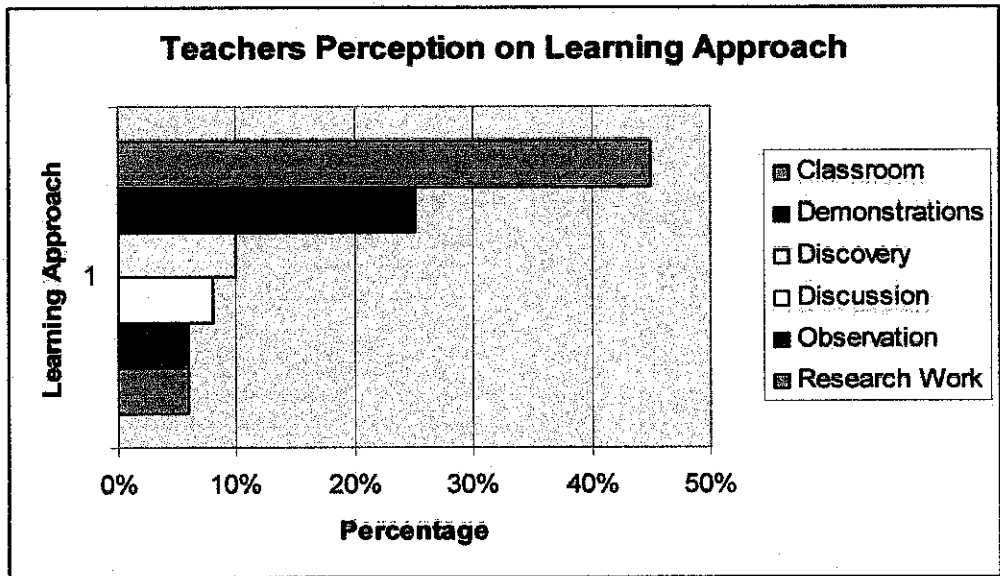


Figure 2.1: Teachers perceptions on learning approach

Relationship between teachers and the learners are usually one to many. One teacher teaches many students (Rashty, 2009). In the classroom, typically teachers will provided all the knowledge and all students will absorbs it. There is no direct one to one communication between the teachers and learners accept if the students go and see the teachers personally or there is a group discussion activity in classroom.

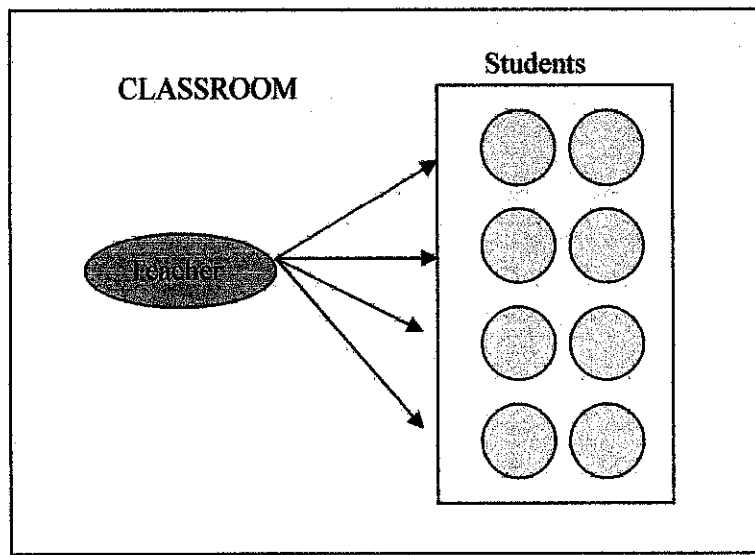


Figure 2.2: One to many relationships

2.1.2 Web-based learning

According to Motah, 2007:

“E-Learning is a new teaching methods to help learners cope with the impact of e-learning and the emphasis laid on Information Technology Education in the Education System at all levels: primary, secondary, tertiary and vocational.”

Web is refers as the biggest collection of information and knowledge where it can easily be access anywhere and anytime at a very fast rate (Baharuddin et al, 2006). By introducing learning in a web is actually making learning process more versatile and up to date. Because web based learning need to be connected to the internet for user to use it, it have the biggest advantage where the content can easily been updated compare to other learning methods.

Web-based learning is also been introduces as a new platform in teaching. It sharpens the Information Technology skills as well as taking the education system to the next level. The relationship here is more focus on one to one communication. The web provides the learners with information and the learners retrieve it.

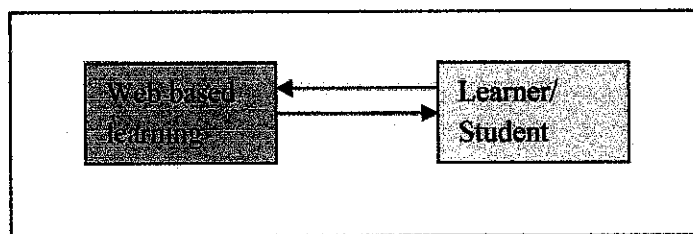


Figure 2.3: One to one relationship

2.1.3 Collaborative Learning

According to (Schrage, 1991):

“Collaboration is when something is there that wasn't there before.”

Collaboration is where sharing process take part. Two or more individuals will interact with each other to create a shared understanding that none had been possessed previously. In his article, Schrage also said that collaboration creates shared meaning about event, process and also product.

What different about collaborative learning (another learning approach) is that it more focus on communication. To perform an educational task, collaborative learning requires learners to exchange their information and work together with other team members. The relationship differs between teachers and learners and learners among themselves (Rashty, 2009).

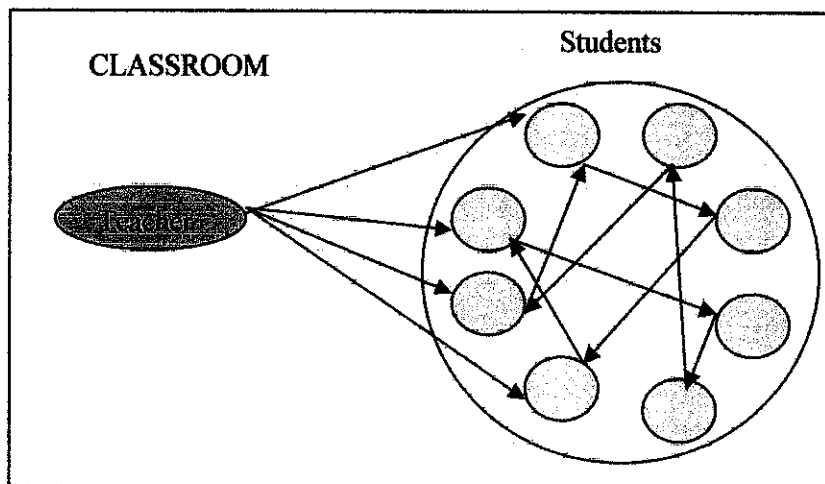


Figure 2.4: Many to many relationships

2.1.4 Multimedia Courseware

Courseware is also an alternative method of teaching. It is usually in the form of stand-alone CDs or DVDs (Baharuddin et al, 2006). Courseware is also known as educative program because it includes educational materials in it. It either can be utilized as a self-learning process where it evaluate the performance of students individually or in a group. Courseware should be considered to be beneficial and helpful resource, especially when compared to traditional methods (Galvao and Baretto, 2006).

Studies on the use of ICT in teaching Mathematics shows that most of the students in Multimedia University used courseware as their ICT tools in learning Mathematics. It shoes that courseware have a very popular demand from the students because it do help in improving the learning process and the understanding the subject (Chong Chee Keong et al, 2006).

Table 2.1: ICT Tools use in class

Application	Using presentation tools	Using courseware	Using graphical visualising tools	Online demos	Others	None
Response (%)	40.5	49.5	8.1	6.3	3.6	29.7

(Source: A Study on the use of ICT in Mathematics Teaching, p45, Table 2)

2.2 BENEFITS IN USING COURSEWARE

Courseware is meant to adopt a multimedia training and education in an organization. It can be a firm and it can also be a school. Courseware will help to enhance the learning process and help to improve the performance results. The following are common benefits in using a multimedia courseware (Hich, 1997).

2.2.1 Improves Learning

Many studies have shown that interactive multimedia learning such as courseware is less time consuming and is enjoyed more compared to other learning methods. In a review of numerous meta-analysis studies (Hich, 1996) found that "learning was higher when information was presented via computer-based multimedia systems than traditional classroom lectures".

2.2.2 Interactive

Interactivity is related to the level of responsiveness and is synonymous as a communication process where each message is related to the previous messages that have been exchanged (Wikipedia, 2009). For courseware, it is interactive because the communication processes include learners, the learning system and the learning materials. For example, a case study on 75 learning studies found that learners can learn faster and have better attitude towards learning when they used an interactive multimedia such as courseware.

2.2.3 Flexible

Courseware on CD-ROM can easily be used either at home or while traveling as long as you have a computer. This learning approach allows flexibility because it is stored in CDs and DVDs. Because of the size, it is handy and easy to bring anywhere and be accessed at anytime. Courseware can also be used on Internet. However, there might be some lower quality images based on the connection speed.

2.2.4 Modular

In most of the courseware, the topic or section can stand alone. Therefore, learners and trainers can look into the topic areas that they need to learn deeply and skip over on the topic that they don't want to. In many cases, applications of courseware include custom build for a specific use where users can select the module.

2.2.5 Practical

Courseware have all the effective methods for developing practical skills by presenting a true life situations that learners face almost everyday. Learners will learn faster when they faced with real problems that have real consequences. Video simulation or simple animation makes courseware more practical and it allows learners to:

- Learn-by-viewing
- Learn-by-doing
- Lear-by-coaching.

2.2.6 Consistent

Computer based courseware results in learning advantages because it usually focuses on instructional design. This design and arrangement is to make sure that the learning materials is well organized and consistent so that it will ease the users.

2.2.7 Timely

Learners can turn on to the courseware whenever they need it or when there is a situation arise. This make the courseware timely because studies reveal that learning is enhanced and better retained when the topic is relevant with the current needs.

2.2.8 Engaging

As been stated before, courseware is an interactive learning. When it contains multimedia elements such as audio, graphics, live-action video, animation and etc, it keeps learners interested and reinforces the skills. It makes the learners engaged with the learning materials because it is exciting, challenging and fun to use. For example, the game courseware makes the users to turn into the program again and again. Through continual practices, learning is absorbed and integrated into a daily performance.

2.2.9 Cost-effective

Looking at the development process, multimedia courseware may have higher cost but compare to the traditional classroom learning only, studies has shown that it is less expensive and more effective. Courseware is less expensive because it saves on the indirect expenses such as time-consuming travel, lodging, training course attended by the teachers and etc. Courseware had analyses learner delivery and performance of important data and results shows it is time-saving.

2.3 ISSUE IN TEACHING MATHEMATICS

According to a mathematician, Benjamin:

"Mathematics is the science that draws necessary conclusions".

Mathematics is not as hard as most of the children thinks. Mathematics evolved process that includes counting, calculating and measurement. In Malaysia, Mathematics is one of the compulsory subject been teach since pre-school. It is a basic learning in most of the educational syllabus all around the world. However, there are some issues found in teaching Mathematics in classroom such as hard to identify students that need extra attention and lack of teaching time.

Because some of this issue, developing a Mathematic Courseware will help student it self to expand their learning process not only in school but also at home. Handy stand alone CDs or DVDs can easily been access as long as there is a computer.

2.4 TEACHING TOOLS

There are many different tools and ways in teaching Mathematics. One of them is called Abacus. An abacus, also called a counting frame, is a calculating tool used primarily in parts of Asia for performing arithmetic processes. Today, Abacus are often constructed as a bamboo frame with beads sliding on wires, but originally they were beans or stones moved in grooves in sand or on tablets of wood, stone, or metal (Wikipedia, 2009). Abacus will be the teaching tools in the Mathematic Courseware that will be develop in this project.

2.5 STUDENT CENTERED MODEL

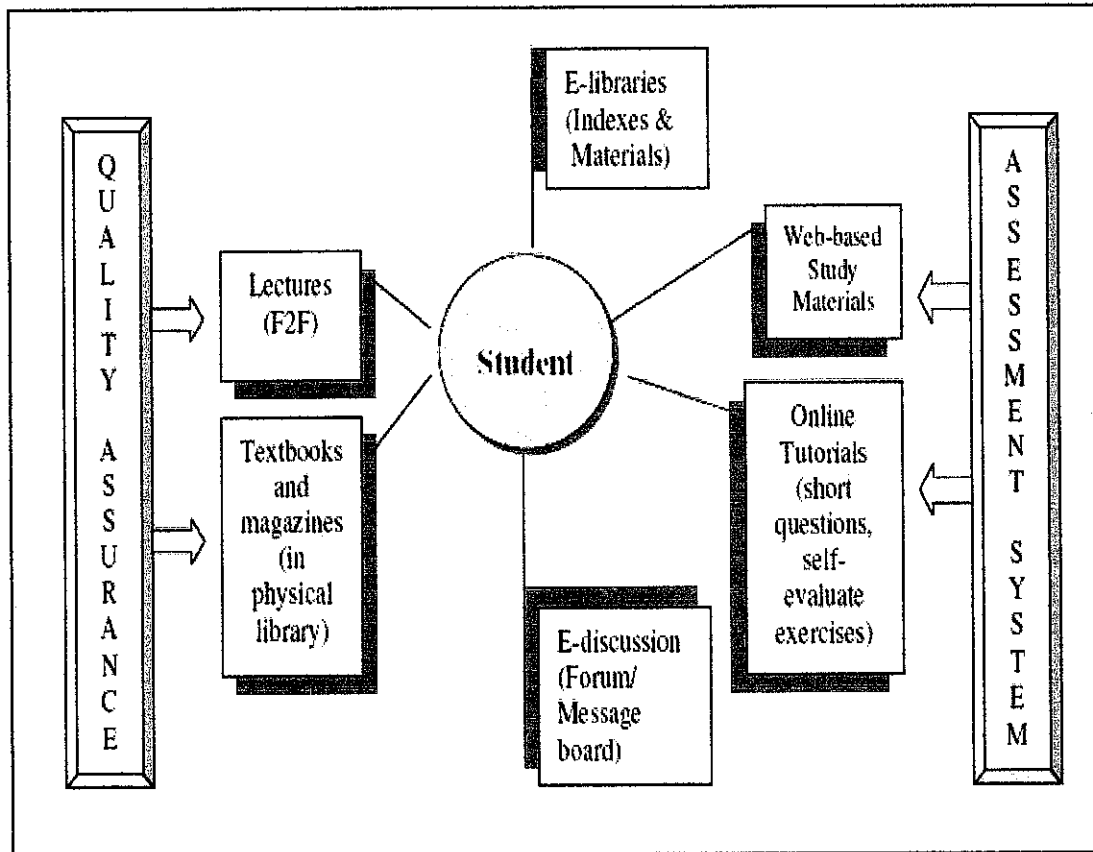


Figure 2.5: Student Centered Model

This represented model is a related works from the previous research (Alicia Tang et al, 2001). The research is been conducted to the students of University of Tenaga National (UNITEN). This model comes out from the theory of “constructivism”. Nowadays, constructivism in education process is increasing. This theory said that learners which are referred to students gain and build new knowledge from the previous teaching. In this case, Mathematical approach of constructivism is been used. This approach allows the student to interact with the surrounding around him/her and involved in the mathematical activities so that they can develop their own knowledge and produce their own skills and understanding.

To build solid based or platform from the knowledge gained, practicing is said to be the most important methods. Therefore, hypertext and hypermedia is been used as one of

the most useful tools to facilitate constructive activities. By using these tools, the information's are branched to many other resources. In order to branch the information's, Internet is seen as a very suitable communicating mechanism to deliver it. Consequently, in order to endorse the active learning purposes, students should:

- Developing initiative and motivation
- Using own's skills and knowledge to solved real problems.

By focusing on 4 aspects, it is believable to endorse the active learning process. The 4 aspects are as follow:

- Student-centered learning
- Non-didactic teaching methods in the student-centered learning model. Normally teachers take control by providing resources and knowledge to the students. However this time, the students her/his self has to find their on knowledge by relying upon faculty as facilitators rather than as knowledge experts.
- Problem-solving
- Practical experience

In Mathematics, students need to work hard and actively in:

- Understanding and solving problems through numerical, graphical and analytical representation.
- Practicing skills that are essential to the course,
- learning how to obtain mathematical models from experimental data
- Linking mathematics more closely to the real world as well as to their own experience.

CHAPTER 3 METHODOLOGY

3.1 PROTOTYPING-BASED METHODOLOGY

A prototyping-based methodology performs the analysis, design and implementation phases concurrently and all the 3 phases are performed repeatedly in a cycle until the system is completed. With this methodology, the basics of analysis and design are performed and work immediately begins on a system prototype, a “quick-and-dirty” program that provides a minimal amount of features. Advantage using this methodology is it can be reanalysis and redesign until the system complete (Alan et al, 2005).

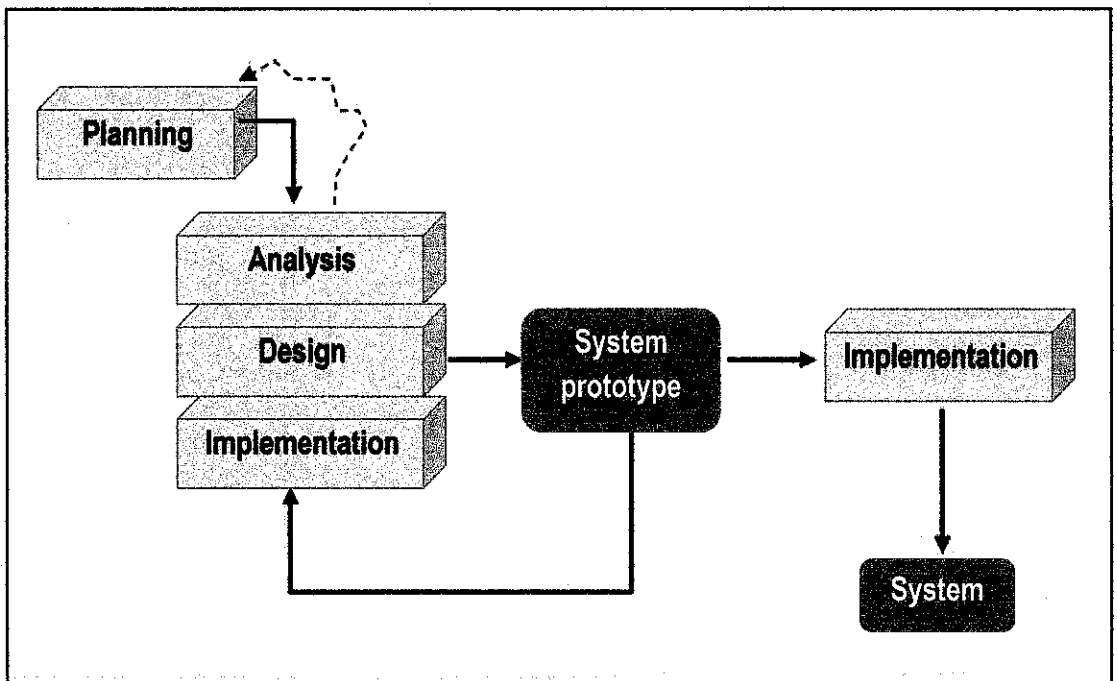


Figure 3.1: A Prototyping-based Methodology

(Source: System Analysis and Design, p12, Figure 1-5)

3.1.1 Planning

During planning phase of the project, the author began by making some research regarding current educational system. It is been done by reading the journal and conference paper. From the research done, objectives and problems statement of the project is been identified. Interviews and surveys are planned to be conducted at the nearest school for information gathering purposes in the analysis phase.

3.1.2 Analysis

There are two main things that the author does during the analysis phase which are:

- Questionnaires – sets of questions given to the parents
- Observations – during Mathematic class for Standard 1 and 2 students.

Two schools in Selayang involved in the analysis phase which are S.K St.Mary and S.K Selayang Jaya. All the information gathered from questionnaires to parents and observation during Mathematic class are then been analysis to find out the feedback from users regarding current system and what they expected from to-be system. The courseware requirements are then been listed out to start developing the courseware.

3.1.3 Design

During the design phase, work immediately begins on the courseware prototype - a rough program that provides a basic storyboard on the flow of the courseware. The author also identifies the courseware framework in design phase. The courseware prototype is been given to the end user to ask for feedback. All the feedback in improving the system from the end user is been recorded for further justification to improve the system.

3.1.4 Implementation

It takes about three to four months for the author to complete the courseware. When the full completed courseware is been developed and the author make some testing to the end user. The end users are:

- Children from 6-8 years old in Arithmetic Learning Center (ALC) at Selayang.
- Standard one student from S.K St.Mary

During testing, end users run the courseware under guidance of teachers. At the same time, the author makes observations to find out any errors or recommendations. The errors been corrected by going back to the analysis phase, followed by design and implementation again until the courseware meets the expectations of the end users.

3.2 TOOLS

3.2.1 Hardware

For this courseware, it has been identified that hardware that will be used for the courseware development are as below:

- CD-ROM
- PC

3.2.2 Software

It had been planned to use some software in order to complete the courseware which are:

- Adobe Photoshop CS2 – for picture editing
- Microsoft Visual Basic 2005 – to design courseware layout

CHAPTER 4

RESULT AND DISCUSSION

4.1 OBSERVATION RESULT

An observation on students' behaviors has been conducted among selected students at S.K St.Mary and S.K Selayang Jaya both in Selayang during Mathematic class. Observation objective is to identify what are the problems occurred in teaching and learning Mathematics in classroom. There are total of 86 respondents.

Based on the observation, most of the learning process, not only in Mathematics subject, there is a one way communication where only teachers are talking and students are listening. There will only be a two way communication if the teachers asked the students and want their response. Also it is actually hard for the teachers to identify which students have any problems on the teaching subjects unless the teacher asked the student to solve the problems and the student can not do it.

For these students who are having problems in the class, they did not ask directly to the teachers. They will just sit and wait for the next learning process. Therefore, developing a courseware might help this type of student who maybe shy to ask their teachers to study on their own and build their own understanding on the subject.

4.2 QUESTIONNAIRES RESULT AND FEEDBACK

Forms of questionnaires have been distributed after the school hour in S.K St.Mary and S.K Selayang Jaya. Target users for these questionnaires are the parents of Standard 1 and 2 students to obtain their views on Abacus Courseware as an alternative method in learning Mathematics. Some conversations on their opinion are also been included as the result of this survey.

Based on the questionnaires (See Appendix 1: Questionnaires) conducted to 50 parents, the following findings were found:

- (i) More than half of them said that their children is not doing well in Mathematics subject and in this case is below the moderate level. 23% of their child is doing very poor and 35% is doing poor. While in other hand, there is only minority which is less than 20% have good and excellent performance in Mathematics. The parents referred their child performance based on their monthly text result.

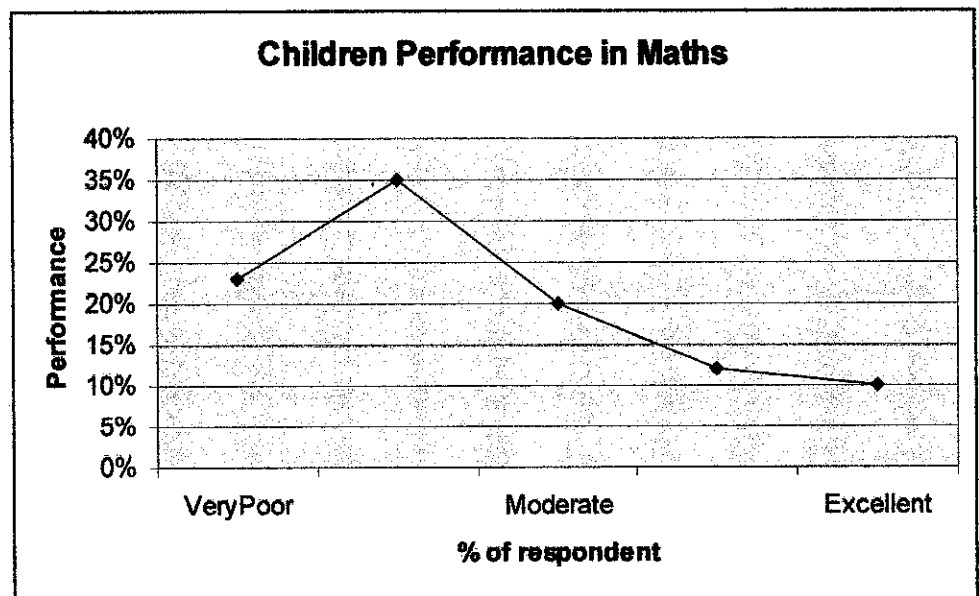


Figure 4.1: Children Performance in Mathematics.

- (ii) 97% agree that having good introduction to Mathematics will make their child enjoy learning it while others said it should come from their child interest. Among 97% who agreed said, good introduction is like a good first impression to children and once they get the good impression, the interest in learning it will follow.
- (iii) 89% agree that books do affect their child performance and most of them said that it is because children easily get bored when they read books.
- (iv) Most of the parents which are 80% always have problems in teaching Mathematics to their children. Highest raking of reasons is that kids do not like Mathematics followed by not enough time to teach because most of them are working parents and lastly the book used is not interesting. In the other hand, another 20% don't have many problems in teaching Mathematics because they send their children for tuition classes, some of them are even teachers and housewife.
- (v) And here are the statistic of the reasons:

Table 4.1: Problems in teaching Mathematics

Kids do not like Mathematics	87%
Book used is not interesting	53%
Others : Lack of time and etc.	80%

- (vi) Almost 100% of the parents agree that alternative method such as courseware is a good way to teach young children on basic Mathematics Operations (addition and subtraction) besides attending classes and they believe that having different approach in teaching will help to improve their children performance in Mathematics.

4.3 CONCEPTUAL FRAMEWORK

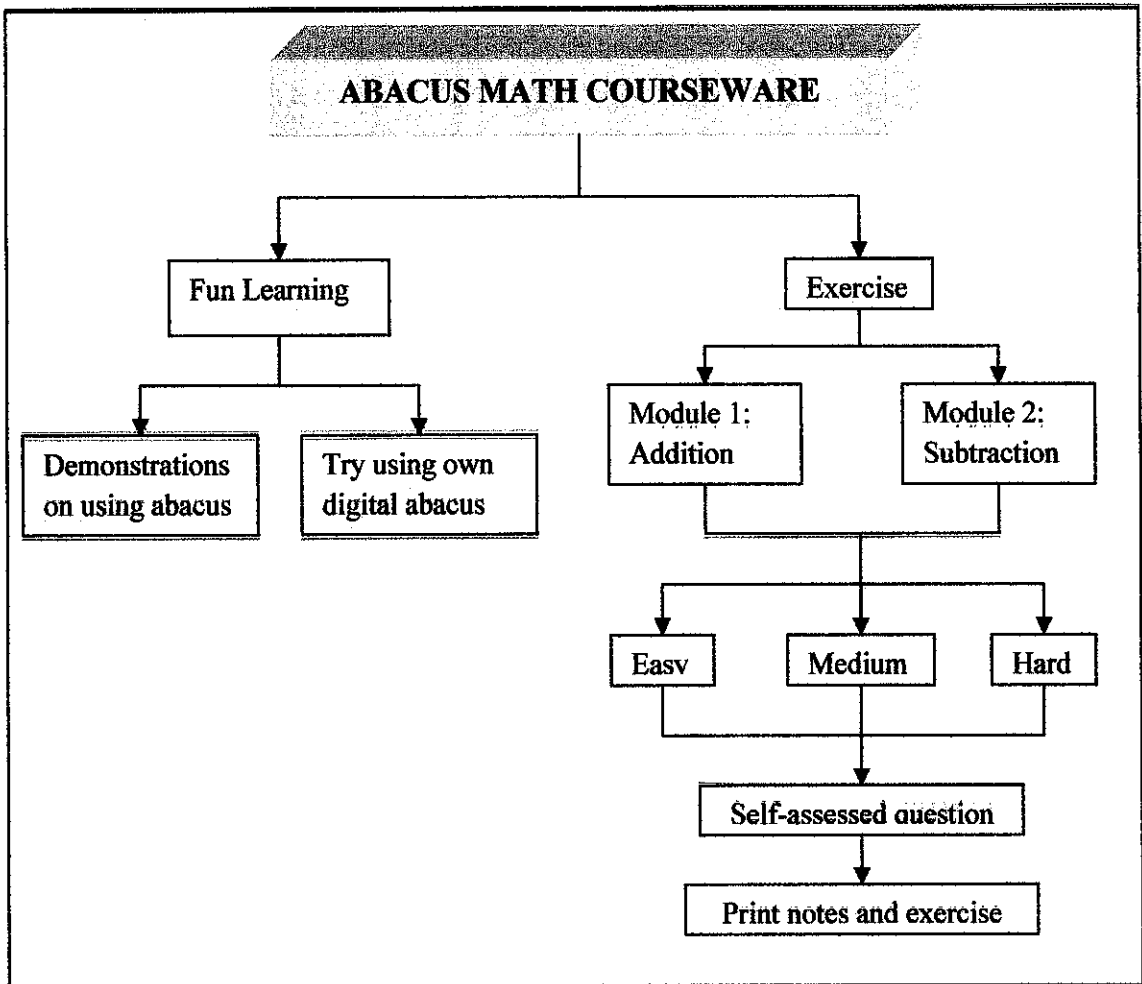


Figure 4.2: Conceptual Framework of Abacus Math Courseware

(Adapted: Conceptual Model for Instructional Design, p6, Figure 4)

4.4 SYSTEM DESIGN

4.4.1 Welcome Page



Figure 4.3: Welcome Page

Figure 4.3 above is the screen shot for the Welcome page of the courseware. It consists of 2 parts which are:

- Fun Learning – consists of Abacus tutorial to teach users on how to use Abacus.
- Exercises – consists of Addition and Subtraction exercises with different level.

If user clicks on Fun learning button, it goes to Figure 4.4 and if user clicks on Exercise button, it goes to Figure 4.5.

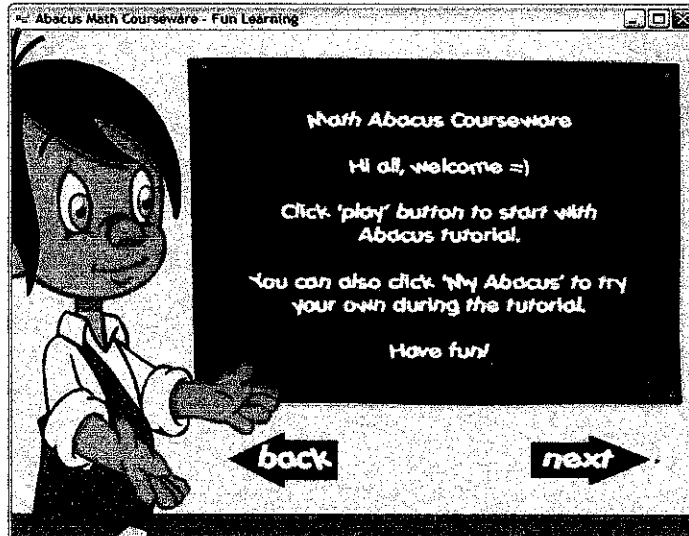


Figure 4.4: Fun Learning Page



Figure 4.5: Exercises Page

4.4.2 Fun Learning

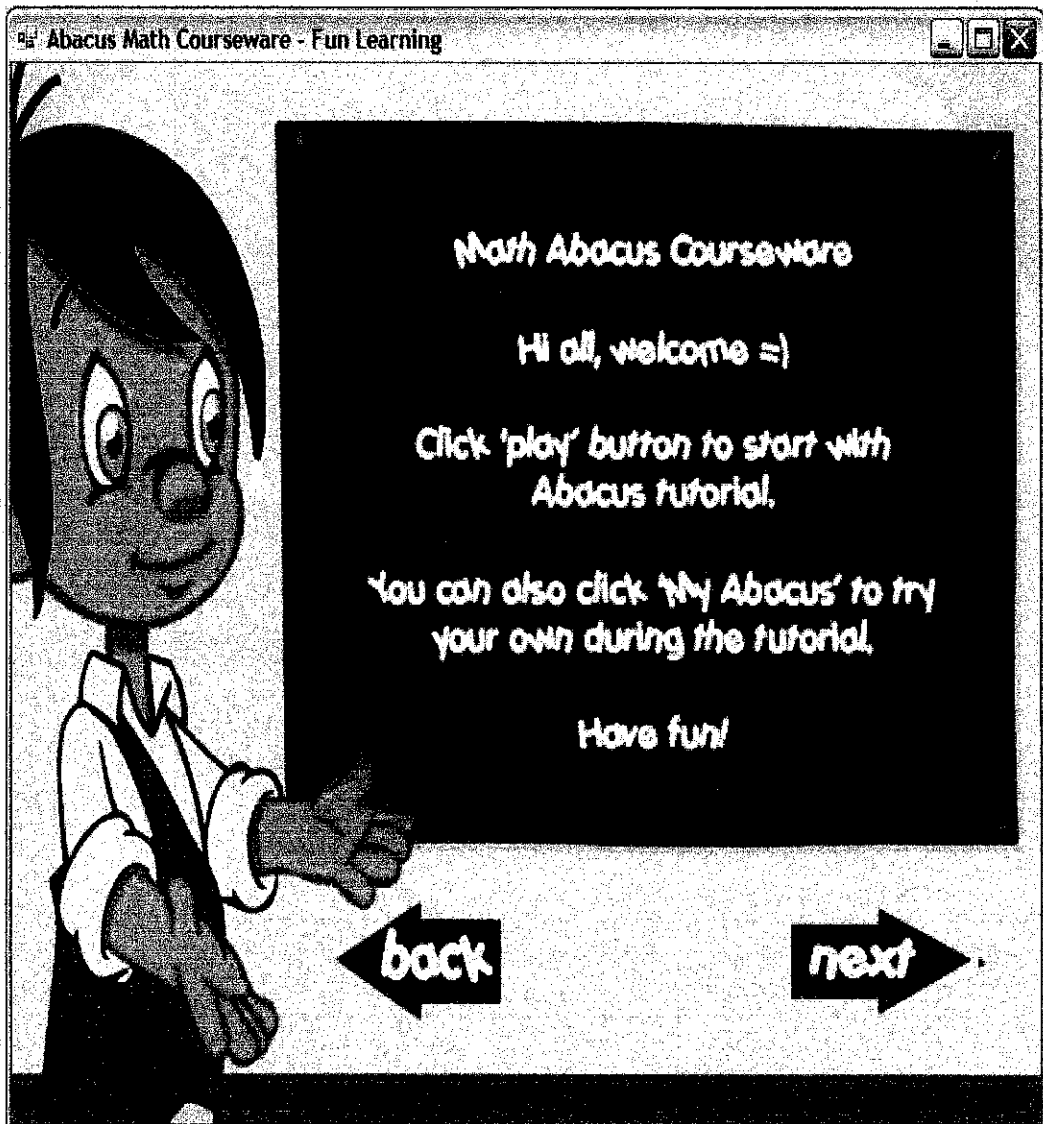


Figure 4.6: Fun Learning Page

In Fun Learning Page, user is given an introduction on how to use the tutorial. When user clicks on the next button, it goes to Figure 4.6. If user clicks back button then it goes back to the Welcome page.

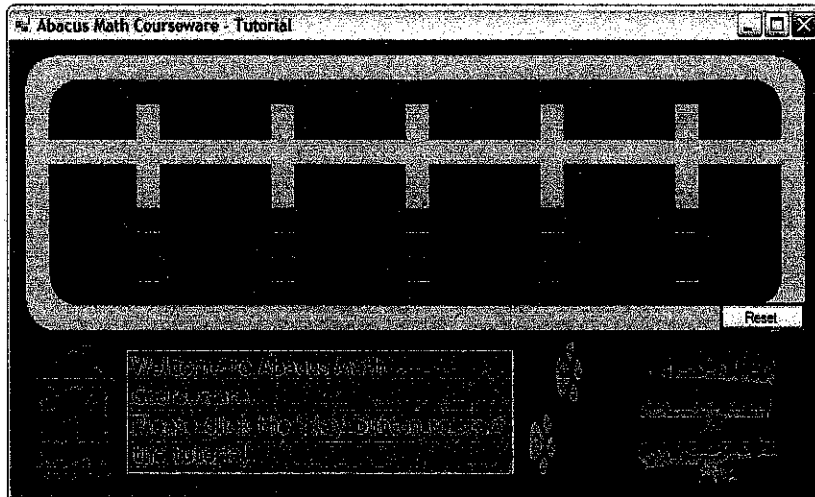


Figure 4.7: Abacus Tutorial

Above is the Abacus tutorial page. When user clicks the play button, the tutorial starts (Figure 4.8). User can also stop the tutorial by clicking stop button or user can try own Abacus (Figure 4.9) by clicking my abacus button.

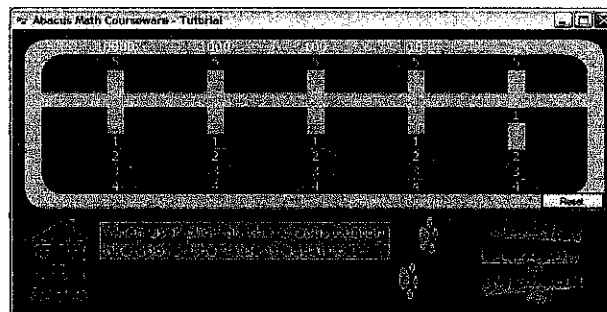


Figure 4.8: Abacus Tutorial - Play

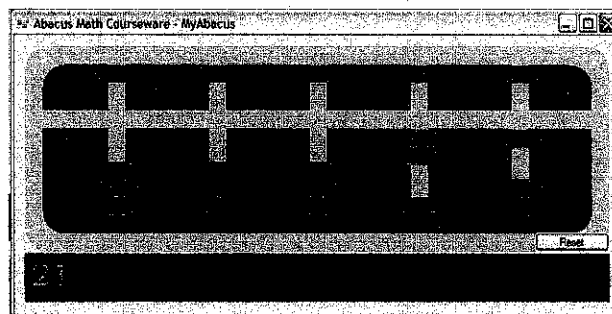


Figure 4.9: My Abacus

User can click on the Abacus button to follow the tutorial and get used of Abacus.

4.4.3 Exercises



Figure 4.10: Exercise Page

In exercise page, user can choose the topics either Addition or Subtraction. Then, user need to choose the level either easy, medium or hard (Figure 4.11).



Figure 4.11: Level Page

4.4.3.1 Addition (Easy, Medium and Hard)

Addition and Subtraction page consist of three levels which are easy, medium and hard. Each level has different interface and different time to complete the exercise which is:

- 5 minutes for easy level
- 10 minutes for medium level
- 15 minutes for hard level

User will not encounter the same question because the author uses random number to generate the question. User can also use the abacus to calculate by clicking on the Abacus button.

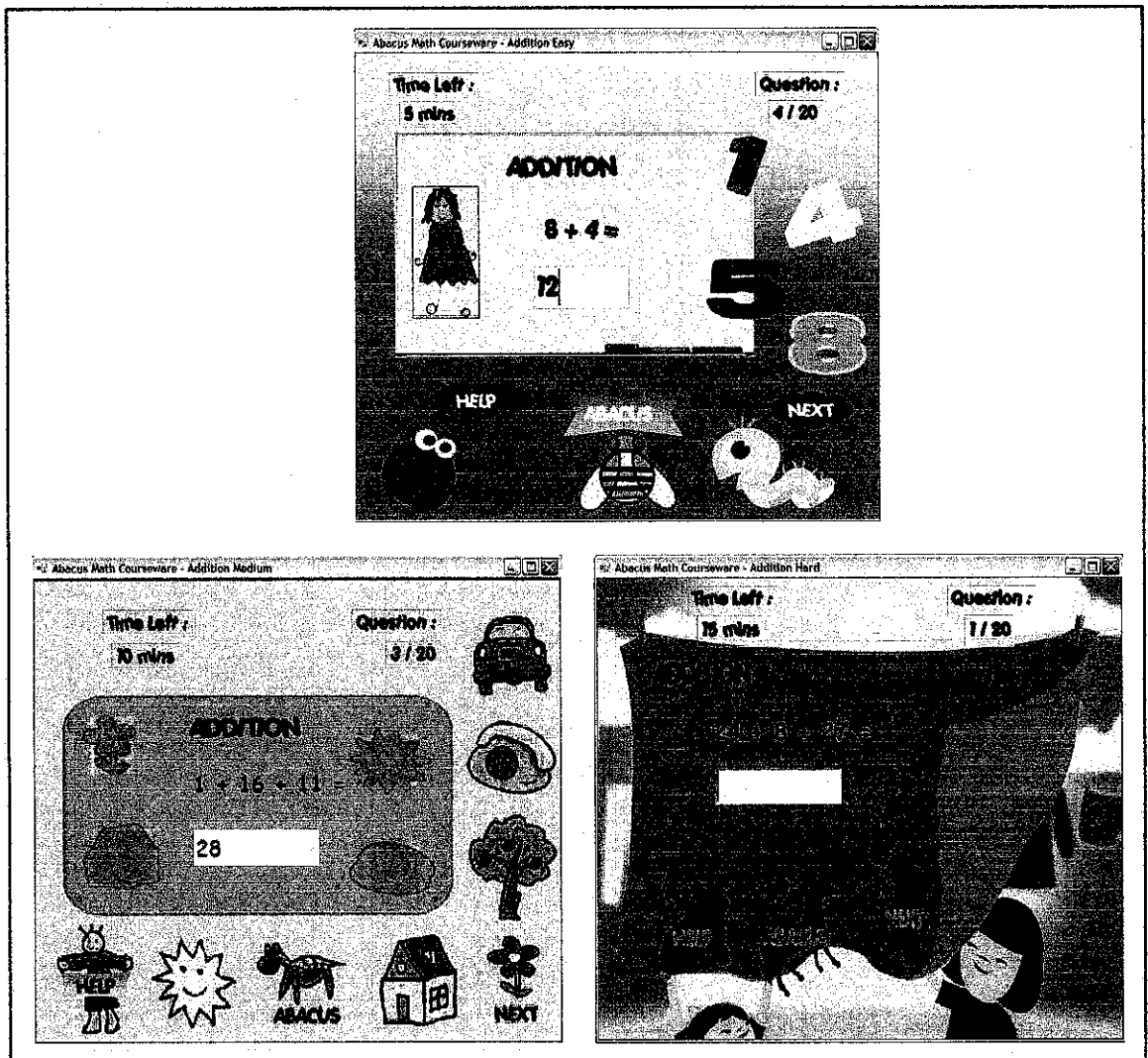


Figure 4.12: Addition pages for Easy, Medium and Hard Level.

4.4.3.2 Subtraction (Easy, Medium and Hard)

Subtraction page have the same function like Addition page. Only the questions set are different.

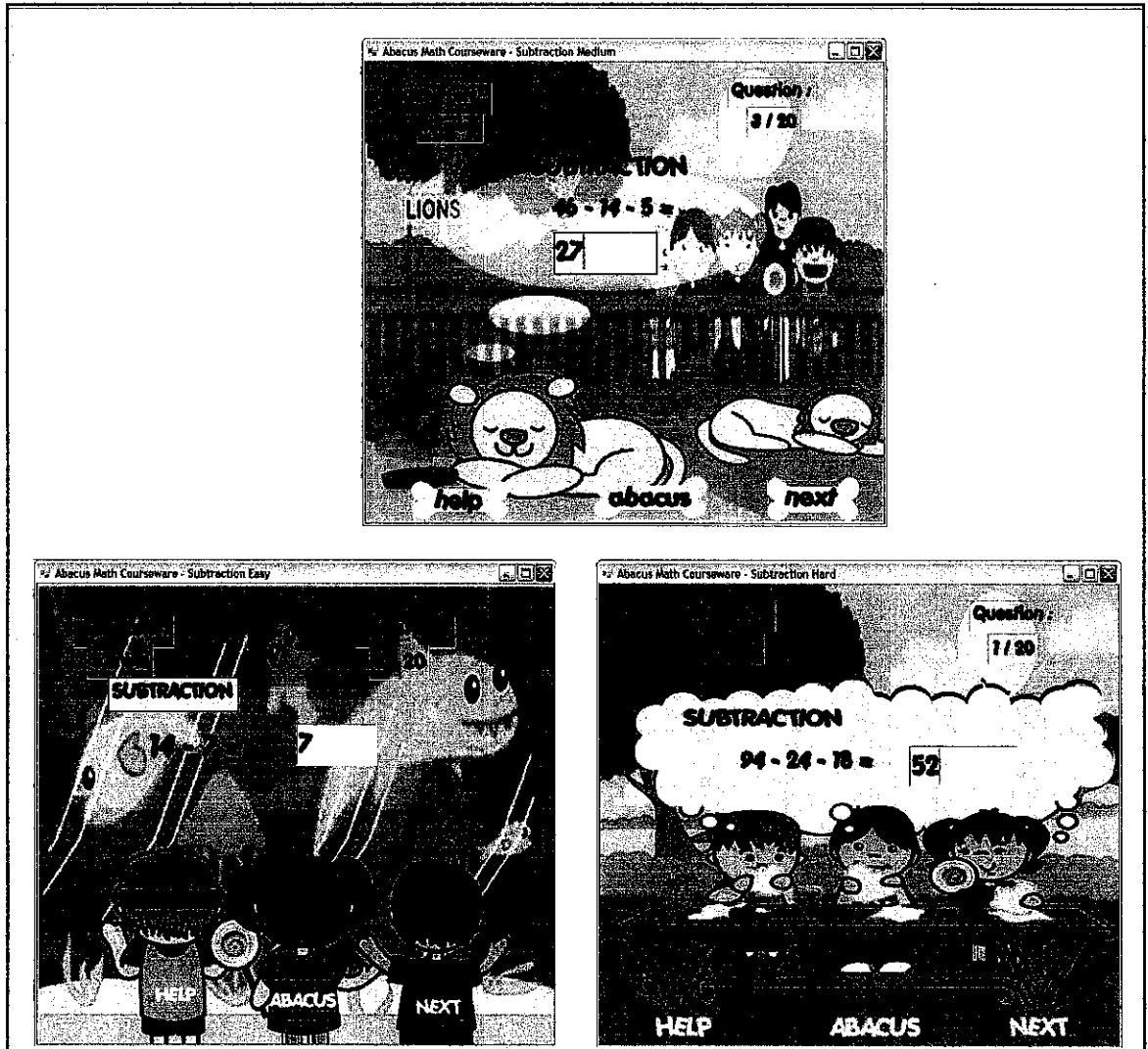


Figure 4.13: Subtraction pages for Easy, Medium and Hard Level.

See Appendix 2: Example of exercise page coding – Addition (Easy Level)

4.4.4 Results

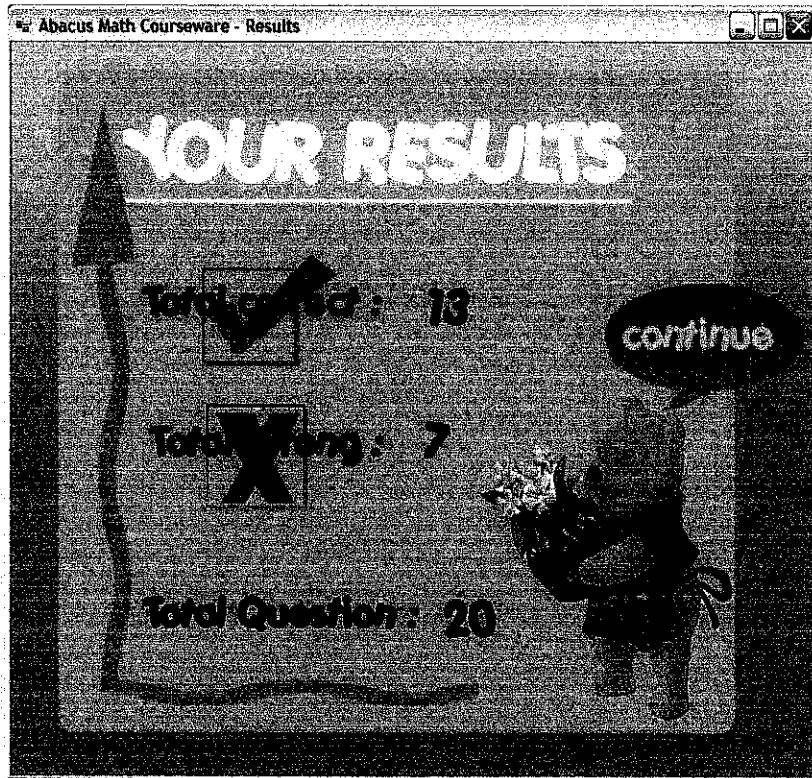


Figure 4.14: Results Page

The results page appears after user had completed the exercise or when it is already times out. The courseware marks total correct and wrong answers also count how many questions is been completed.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

For now, both objectives have been achieved. The first objective is to study on the suitable method to be applied in the project. The usage of ICT in teaching Mathematics can make the teaching process more interactive and therefore enhance the student capabilities in learning.

The second objective is to develop a Mathematic courseware in teaching addition and subtraction that includes special Mathematic tool which is Abacus. It shows that Mathematic Courseware is one of the possible approaches in verifying the methods in teaching Mathematics to young children. Besides been teach at school manually, this courseware can be used as extra exercises for young children to get familiar with basic Mathematics operation and indirectly attract their interest in learning Mathematics.

As a conclusion, a full functioning Mathematic Courseware has successfully been developed and so far gets positive feedbacks from the users.

5.2 RECOMMENDATIONS

Based on the feedback that the author gets, some improvement can be made to make sure that the courseware is more reliable in the future. The recommendations are as follows:

- Make time ticking in the exercise form and give warning the user for the last 30seconds that they have.
- Link the Abacus with the form to make the courseware more users friendly. Therefore, users no need to insert the answer manually in the form.
- Includes tutorial on how to make addition and subtraction using Abacus.

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APPENDICES

Appendix 1 : Questionnaires

Final Year Project Case Study: Abacus Courseware

This survey will help research activity for developing an Abacus Courseware. The courseware helps young children to learn basics Mathematics by using abacus. Kindly rate according to:

1. very disagree/ very poor/no
2. disagree/ poor/seldom
3. don't know/moderate/sometimes
4. agree/good/always
5. very agree/ excellent/yes

How is your child performance on Mathematics subject? (1-very poor to 5 – excellent)	
Having good introduction to Maths will make young children enjoy learning it.	
Do you agree current teaching methods (Books) affect your child performance?	
If yes, why did you say so? <input type="checkbox"/> Books did not attract young children <input type="checkbox"/> Children easily get bored when reading books Others : _____	NULL
Do you have any problem teaching Maths to your children?	
What is/are the problem(s) that you usually faced while teaching Maths to your children? You may tick more than 1. <input type="checkbox"/> Kids do not like Maths <input type="checkbox"/> Books used is not interesting Others : _____	NULL
Do you agree that alternative method such as courseware is a good way to teach young children on basic Maths Operation?	
Having different approach in teaching will help to improve children performance in Maths?	
Do you agree by implementing the project (Abacus courseware), it can ease child process in learning Maths?	

Thank you for your time and assistance.

Appendix 2 : Example of exercise page coding – Addition (Easy Level)

```

Public Class addeasy
    Protected m_intCurrentQuestion As Integer = 1
    Protected m_intTotalQuestions As Integer = 20
    Protected m_intTotalCorrect As Integer = 0
    Protected m_intCorrectAnswer As Integer = 0
    Protected m_intTimeoutMinutes As Integer = 5 ' Set time out minutes here
    Protected m_intCurrentMinutes As Integer = m_intTimeoutMinutes ' This is the current
minutes show on the form
    Private Sub Form1_Load(ByVal sender As System.Object, ByVal e As System.EventArgs)
Handles MyBase.Load
        Clear()
        Timer1.Interval = 1000 * 60 '(1000 = 1 second, * 60 equals 1 minute) it will
tick every minute
        Timer1.Start()

        GenerateRandomNumber() 'Generate random number on the screen
    End Sub

    '''function to clear local variables
    Private Sub Clear()
        m_intTotalCorrect = 0
        m_intCurrentQuestion = 1
    End Sub
    'next button
    Private Sub PictureBox1_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs)
        If txtAnswer.Text.Length = 0 Then ' if no answer is entered
            Exit Sub
        End If
        If txtAnswer.Text.Trim = m_intCorrectAnswer Then ' If correct answer, add total
of correct answer
            m_intTotalCorrect += 1
        End If
        GenerateRandomNumber()
    End Sub

    '''Generate Random Number based on probability of number 1 to 9
    Private Sub GenerateRandomNumber()
        Dim nRandom As New System.Random
        Dim intRandomNumber1, intRandomNumber2 As Integer
        Dim intCount As Integer = 1
        Dim objEval As New EvalClass

        txtAnswer.Text = ""

        If m_intCurrentQuestion > m_intTotalQuestions Then ' Stop the questions
            Dim objForm As New frmResult 'form to display results

            objForm.m_intTotalCorrect = m_intTotalCorrect
            objForm.m_intTotalQuestions = m_intTotalQuestions
            objForm.m_intCurrentQuestion = m_intCurrentQuestion - 1
            Me.Hide()
            objForm.Show()
        End If

        intRandomNumber1 = nRandom.Next(1, 9)
        intRandomNumber2 = nRandom.Next(1, 9)

        ' Loop until the equation answer is more than 0
        Do While objEval.Evaluate(intRandomNumber1 & " + " & intRandomNumber2) < 0
            intRandomNumber2 = nRandom.Next(1, 9)
        Loop

        ' Display total question answered
        lblQuestion.Text = m_intCurrentQuestion & " / " & m_intTotalQuestions
        m_intCurrentQuestion += 1
    End Sub
End Class

```

```

    ' Display the question
    lblquest.Text = intRandomNumber1 & " + " & intRandomNumber2 & " = "

    ' Evaluate the numbers to get the actual mathematical answer
    m_intCorrectAnswer = objEval.Evaluate(intRandomNumber1 & " + " &
intRandomNumber2)
End Sub

''' Capture user key to make sure it accept numbers only
Private Sub txtAnswer_KeyUp(ByVal sender As Object, ByVal e As
System.Windows.Forms.KeyEventArgs) Handles txtAnswer.KeyUp
    If txtAnswer.TextLength = 0 Then ' if nothing entered
        nextbtn.Enabled = False
        Exit Sub
    End If
    If Not IsNumeric(txtAnswer.Text) Then
        txtAnswer.Text = txtAnswer.Text.Substring(0, txtAnswer.Text.Length - 1)
        txtAnswer.Select(txtAnswer.TextLength, 0)
        If txtAnswer.TextLength = 0 Then
            nextbtn.Enabled = False
        End If
        Exit Sub
    Else
        nextbtn.Enabled = True
    End If
End Sub

''' This is a function which runs automatically every minute
''' It will display how many minutes left
Private Sub Timer1_Tick(ByVal sender As Object, ByVal e As System.EventArgs) Handles
Timer1.Tick
    m_intCurrentMinutes -= 1
    lblTimer.Text = m_intCurrentMinutes & " mins"
    If m_intCurrentMinutes = 0 Then
        Timer1.Stop()
        MsgBox("Timeout.")
        Dim objForm As New frmResult

        objForm.m_intTotalCorrect = m_intTotalCorrect
        objForm.m_intTotalQuestions = m_intTotalQuestions
        objForm.m_intCurrentQuestion = m_intCurrentQuestion - 1
        Me.Hide()
        objForm.Show()
    End If
End Sub

'next button
Private Sub PictureBox1_Click_1(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles nextbtn.Click
    If txtAnswer.TextLength = 0 Then ' if no answer is entered
        Exit Sub
    End If
    If txtAnswer.Text.Trim = m_intCorrectAnswer Then ' If correct answer, add total
of correct answer
        m_intTotalCorrect += 1
    End If
    GenerateRandomNumber()
End Sub

Private Sub abacusbtn_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles abacusbtn.Click
    myabacus.Show()

End Sub

Private Sub PictureBox2_Click_1(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles helpbtn.Click
    Help.Show()
End Sub
End Class

```