A Web Based Intelligent Tutoring System

For Arithmetic

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ABSTRACT.

The twenty first century among others has depicted a wide array of events and technologies in its quest to revolutionize all aspects of life in a multitude dimensions of fields. The field of learning, which is among the oldest field of human achievement, is one of the most important fields that constantly need new techniques and methods to help students to achieve better. The days of a student sitting through books and other paper works is slowly disappearing to give way to new mediums such as the computer and internet. Slowly, but surely. Today, many educational packages are on the market and the internet for a long time. These packages cater for a variety of people which include students, teachers and even parents. Many are good but some do have its short comings. Keeping this in mind, I decided to build an Intelligent Tutoring System for Arithmetic. The syllabus of arithmetic is designed such as to mould the students who are thought the very basics in primary school to further enhance their capabilities in mathematics. They are thought a higher level of mathematics more effectively to help prepare them further higher level of mathematics that will be thought in upper secondary school. I believe it's important to build a strong foundation and liking for mathematics in order to ensure that they will be ready to face new and often exciting challenges that they will encounter in their studies. To love something, we have to like something. And to like something, we have to know something. That is the primary aim in this quest to develop a system that will not only help tremendously the students but also create an awareness and liking for mathematics. The Intelligent Tutoring System is thus proposed to overcome any shortcomings that other systems in other fields have. To start with, the ITS is a web-based learning system. It covers all the syllabus that will be tested in UPSR. The

system provides short notes, quiz, interesting bits of mathematics and its history, and a modal examination paper to prepare students for the examination. The proposed system will have and attractive users interface which includes images, be it graphic or animation to make the learning process more fun and efficient. And to help lost or inexperienced computer users, the system will be built to cater the needs and help students along the way. In order to build a comprehensive system, related information is gathered from the books, internet and other learning material. Internet is chosen to be the platform for the development of this project. Interested users will find it easy to access this system at any time and will be free to go through, evaluate and to use it since it's on the web and freely available. This system will be built using a number of programming tools like HTML, JavaScript and C. To make it more interesting, other graphic tools like Flash and Dreamweaver to further develop this system. It is hoped that the development of this ITS will further assist students to better appreciate and develop a liking towards mathematics and ultimately achieve better skills in mathematics.

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CHAPTER ONE

Introduction

1.0   Introduction.

In this era of Information Technology, a significant amount of educational activity takes place online. A variety of courses that are offered on the World Wide Web is on a constant rise ever since the very first educational package was introduced on the internet. The flexibility of learning on the internet is apparent since not only students are able to use them but also teachers and even parents. The students these days are on a constant go to excel in their studies and are often on a look out for new techniques and tactics to make sure they succeed. This is proven by the number of student who take extra classes and tuition to get that extra edge on their studies. Educational learning tools and packages are the obvious next step in this paradigm shift. This is where the Intelligent Tutoring System comes in. A student learns from an ITS by solving problems. The system selects a problem and compares its solution with that of the student and then it performs a diagnosis based on the differences. After giving feedback, the system reassesses and updates the student skills model and the entire cycle is repeated. As the system is assessing what the student knows, it is also considering what the student needs to know, which part of the curriculum is to be taught next, and how to present the material. It then selects the problems accordingly.

1.1   Project Definition.

In mathematics, students learn all about mathematics. They learn what is mathematics, its concepts, its design, and how to use them in making decisions and solving problems. The days of a student sitting through books and other paper works is slowly disappearing to give way to new mediums such as the computer and internet. Today, many educational packages are on the market and the internet for a

long time. These packages cater for a variety of people including students, teachers and even parents. Mostly, the packages are good but not without some short comings. Keeping this in mind, I decided to build a Web Based Intelligent Tutoring System for Arithmetic. The syllabus of mathematics for arithmetic is designed such as to mould the students who are thought the very basics in primary school to further enhance their capabilities in mathematics. They are thought a higher level of mathematics to help prepare them further higher level of mathematics that will be thought in upper secondary school. It's important to build a strong foundation and liking for mathematics in order to ensure that they will be ready to face new and often exciting challenges that they will encounter in their studies. That is the primary aim in this quest to develop a system that will not only help tremendously the students but also create an awareness and liking for mathematics. The Intelligent Tutoring System is thus proposed to overcome any shortcomings that other systems in other fields have.

1.2   Aim.

The aim of this project is to build a system that would benefit users in multiple angle. Among the intentions of the proposed project is to develop a high quality courseware that is beneficial for the use of school, private educational institutions such as tuition centres and of course, home use. This project also would be a catalyst to make computers as learning tools and to ensure the effectiveness of capturing the users interest in the process of learning, which is very important.

1.3   Objectives.

- These are the objectives of the proposed system.

- To design and develop a web-based interactive learning and teaching mathematics system for the primary student and schools.

- To develop an effective and interesting learning tool.

- To innovate a better learning and teaching approach with the help of graphics and animation texts.

- To better encourage the usage of computers by students in learning; and

- To better know and understand mathematics and all of its rules, principles, concepts and theories.

1.4   Project Scope.

This project targets on developing a windows-based tools which is accessible through the internet that can be used by not only the targeted students but also other students. The system is presented using simple English with its design that is not complicated so that the usage and clarity of the system is focused. The targeted users are the primary school students, primary school teachers and parents. The syllabus will follow exactly the Kurikulum Baru Sekolah Rendah (KBSM). It will have simple and easy to follow notes on mathematics. It will also have exercises and tutorials on every sub-topics and modal exam papers true to the standard. The ITS will feature a step by step guidance and hints on how to answer the question posed effectively. It would also feature an attractive and interactive interface users interface. Among the assumptions that were made is that the access to the internet is readily available as this is a web-based application and it only can be retrieved online from the web.

Another assumption is that the students, teachers and parents a like have the basic knowledge of handling computers and would be able to counter minor problems that might arise.

1.5   Limitations.

The limitation that we have to take notice is that the system is only suitable for primary school students. The lower secondary school student would be able to use this system as a tool to revise what they have learned in mathematics until Standard 6. It is only suitable for primary school students simply because of the matter of easier syllabus that would be presented in the system. As always, the guidance from parents and teachers is necessary to monitor the students so that they don't misuse or stray from the Intelligent Tutoring System to other inappropriate sites.

1.6   Project Timeline.

MONTH	MARCH				APRIL				MAY			
WEEK	1	2	3	4	1	2	3	4	1	2	3	4
Feasibility study	■	■	■									
System definition			■	■	■							
System analysis			■	■	■	■						
System design					■	■	■	■	■			
Report							■	■	■	■		

MONTH	NOVEMBER				DECEMBER				JANUARY				FEBRUARY			
WEEK	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Coding	■	■	■	■	■	■	■	■								
System documentation							■	■	■	■						
Testing and review										■	■	■				
Presentation													■			

1.7   Report layout.

Chapter One – Introduction.

Chapter one is an overview of the systems overall perception of the system proposed.

Chapter Two – Literature Review.

Chapter two consists of the various researches done prior to the design an implementation of the application. Decision made on this application will be based on the research results accumulated in this chapter.

Chapter Three – Methodology.

Chapter three discusses various modules, system properties, architecture and decisions of software as well as hardware intended for the development of this application.

Chapter Four – System Design.

Chapter four describes the different designs used during the project development. It covers structural design, Data flow Diagramming (DFD) and the user interface design.

Chapter Five – System Implementation.

In chapter five, the overview implementation of the application will be thoroughly explained in this chapter. System implementation describes the environment, tools, coding and development of the individual modules.

Chapter Six – System Testing.

Chapter six covers the techniques and methods of testing the completed application. All systems must go through a series of testing before it is deployed as a fully functional application.

Chapter Seven – System Evaluation .

This is the final chapter whereby the entire application is evaluated. This chapter outlines the strengths and weakness of this application. Suggestions of future enhancements of this application will be given. Lists of problems faced during implementation and experiences gained through out the project would also be included.

Conclusion.

This chapter is the conclusion of the whole project.

CHAPTER TWO

Literature Review

2.1   Purpose.

Literature Review is the background study about the knowledge and information gained to develop this project. With this study, we can get better understanding on the development tools that are used to develop a project. It helps us to get a better idea on the development methodology that is used while developing a project. An important part of literature review is developers study an existing or – past developed project and find out its weakness and its strength. From there, developers can find solutions to curb the weakness and improve the existing strength of these project to make sure that the is going to be developed will be of high quality. Reference, related article and journals, existing interactive multimedia software in the market and existing online web-based learning application have been analyzed to gain the necessary information. These information are to ensure that the proposed system is much better compared to the existing system. It is very important that the same weakness will not find its way to the new proposed system.

2.2   A look at Web-based Learning

2.2.1   An Overview Of the Web-based Learning.

Web-based learning is derived from the term 'e-learning'. It is one of the tools with which education is delivered. In traditional academic institutions, web-based learning systems are generally housed administratively in a 'distance education' department alongside other at –distance delivery methods such as correspondence, satellite broadcast, two way videoconferencing, videotape and CD-ROM/DVD delivery

system. Web-based learning seek to serve learners at some distance from their learning facilitator. Many such system attempts to serve learners interacting with the learning source at different chronological times (for an example, e-mail). Distance education is often referred to as those delivery modalities that seek to reduce the barriers of time and space to learning, thus the frequently used phrase 'anytime, anywhere learning'. The simplest definition of web-based learning is the delivery of interactive training or education over the Internet/Intranet. It is structured transfer of skills or knowledge that takes place using the World Wide Web as the distribution channel. The way this interactive learning is implemented varies greatly. A full service learning community offering will likely have to support many approaches to on-line learning design and delivery.

2.2.2 Advantage of Web-based learning.

There are plenty of advantages created by web-based learning. Among them are:

- Geographical independence

  In a web-based classroom, learning is no longer restricted to the physical buildings of the learning institutions and the problem of over crowding will not materialize.

- Temporal independence

  Students can study whenever it is convenient for them. There are no longer need for the teacher and learners to synchronize their time tables and meet at the same place and time. Students will overcome the problem of skipping classes.

- Computer-based

  All the information that is needed and all communications in a web-based classroom passes through or is stored in a web classroom can be changed at any time and become available to students almost immediately.

- Increased Communication

  The web allows students to talk to each other, either individually or as a group, and to send questions or hold discussions with their instructor.

- Convenient location

  Using the web, distance learning can take place in many convenient locations, such as office or home or anywhere with an access to the internet. Students can take course during traditional term or training session. They can even take their time to complete learning activities. Convenience is the key word here.

2.2.3 Disadvantages of Web-based Learning.

As there were advantages, so are disadvantages. Among them are:

- Web-based learning has different set of cost associated with it than the everyday learning. These cost include purchase or implementation of web-based delivery platform. The cost associated with server support, and additional instructor time required to lead an online course.

- Online course often only deliver information rather than foster the kind of interaction that leads to effective learning normally only delivers information but does not deliver learning.

- The web material can't identify individual student problem. Although web-based learning can reach large number of students, it can't identify individual problem.

2.3   What is CD-ROM Based Learning.

The term CD-ROM based learning refers to the use of CD-ROM based technologies to deliver a broad range of solutions that enhance knowledge and performance. With the rich multimedia capability, CD-ROM based learning can simulate up to 98% of classroom training. Basically, the advantages and disadvantages of CD-ROM is almost similar to those of the web-based learning. Below are some additional advantages and disadvantages given to further deepen our knowledge.

2.3.1 Advantages of CD-ROM Based Learning

- The cost of producing a CD is inexpensive. With the wide usage of CD, the price of a CD-ROM package available in the market is very cheap.
- We normally do not need a network connection. A CD drive on a normal computer is sufficient.

2.3.2 Disadvantages of CD-ROM based Learning.

- Information that is stored in a CD is Static and cannot be changed or updated. Therefore, the developer needs to be sure about the content that will be included in the CD. If changes are to be made and additional information are needed, a new CD must be produced.
- Another disadvantage is there is no form of communication. Users cannot interact or have discussions with anybody.

2.4   What is Multimedia.

To put it in a simple manner, multimedia is not a single piece of technology. Multimedia stands for the convergence of several streams of development in computing audio, video, and communication industries. The term, 'multimedia' is often used but hard to define. It is used to advertise different products such as video games, computer based training, sales presentation and much more. Multimedia can be called an integration of more than one medium. Even current media system such as newspaper and television fall within the scope of multimedia. Using multimedia then, is simply using a variety of media with the intent of communicating. As for today, inexpensive, powerful personal computers and many easy to use authoring languages, multimedia production has never been more accessible.

2.4.1 Typical Multimedia Applications.

The range of multimedia tools can be further be breakdown into there typical multimedia application areas:

   a) Text-based Applications.

   b) Interactive Applications.

   c) Wide-Area Applications.

An appropriate tool can be chosen if some factors are decided upon. Those are the application which is to be developed, who the audience are, what information that is to be conveyed and just how much interaction there will be between the application and the user.

2.5   Approaches Used in Gathering Information.

A system is a collection of objects and activities, plus a description of relationship that tie the objects and activities together. Typically a system definition includes for each activity, a list of requirement, action taken and output produced. A system can be developed in different way. Before developing system information about the characteristics and purpose of the system to be developed, the procedures involved in developing the system and the methodologies used to develop the system need to be gathered. There are many sources, which this valuable information can be obtained from.

Each source will provide different information and facts depending on the keyword or phases used to obtain the information. Information can be obtained from system user through survey and questionnaires, the Internet, books, reviews of existing system and so on. For the gathering information to develop the interactive multimedia, the resources included electronic media, printed media, and survey and questionnaires.

The internet which is the electronic media provide a lot of information regarding methodologies for the system development information about the most suitable hardware and software to be use, and development tools. Beside that because the ITS is a web based learning programs example of existing programs is being reviewed to specify the necessary requirements. Various search engines were used in the process of gathering information such as Goggle, Yahoo, and Dogpile search. The specific keyword used for the search depends on the topic of the information we are looking for.

As for the printed media, books were used to get detailed information about the development models, authoring tools and the process of capturing requirements to develop the system.

A survey was carried out to gather information from the end users who will be the user of the system developed. Results from the survey were analyzed to be into consideration when developing the system.

2.6   Findings.

All the information gathered for can be divided into electronic media, printed media, and survey and questionnaires. Printed media includes sites which are found on the World Wide Web using specific keyword. Below are the findings in detailed that are featured.

2.6.1 Printed Media

I.   Internet and World Wide Web- How to Program

    Author   :   H.M. Deitel, P.J. Deitel and T.R. Nieto.

    Publisher   :   Prentice Hall

The Internet and World Wide Web are revolutionizing software development with multimedia-intensive, platform-independent code for conventional Internet-, Intranet- and Extranet-based applications. This college-level textbook carefully explains how to program multitiered, client/server, database-intensive, Web-based applications.

II. Instant JavaScript

    Author   :   Martin Webb, Michael Plungjan, Keith Drakard

    Publisher   :   McGraw Hill.

This book shows how to create a wide range of applications-from banners and other Web graphics to forms and frames- and much more. In addition, it provides hands-on information for customizing and extending scripts for use in different environments.

III. Using HTML 4 (Sixth Edition)

Author   :   Molly E. Holzschlag

Publisher   :   QUE

This book shows what HTML 4 is and how to use it in the real world. We can develop a well-formed HTML documents with text, lists, links, color and images. We can also create sites that look fantastic and conforms to accessibility guidelines.

IV. Inside Adobe Photoshop 5.5

Author   :   Gary David Buton, Barbara Buton

Publisher   :   New Rider Publishing

This book gave insight of what Adobe Photoshop is all about. It gives an in-depth understanding of how to create high quality graphics. It also teaches animation, images composition and many more to enhance web output.

V. Software Engineering-Theory and Practice

Author   :   Shari Lawrence Pfleeger

Publisher   :   Prentice Hall

This book explains the various types of development models. The step model was explained thoroughly and it lists out advantages and disadvantages of each models. The book was also referred to understanding the process of capturing the requirement to develop an online computer learning package.

2.6.2 Electronic Media.

2.6.2.1   Sites on Web-based Learning

http://www.outreach.utk.edu/weblearning/

This site gives an overview of web-based learning. It provides an insight about web-based learning, explores the advantages of web-based learning and discusses the disadvantages of the web-based learning system.

http://www.epsys.com.sg/implementing_ed.htm/

This site discusses the pros and cons of implementing a CD-ROM based solution. It also gives a brief information about CD-ROM based learning and other basic information that could be connected with our project.

2.6.2.1.1 Sites on Web Designing

http://www.macromedia.com/support/dreamweaver/ts/documents/presalesfaq.htm

This site is all about Dreamweaver and it provides information for the user to understand what Dreamweaver is about. It answers common questions about Dreamweaver and tackles every problems that a user might pose.

http://archive.ncsa.uiuc.edu/General/Internet/WWW/HTMLPrimer.html

It is an introduction and does not pretend to offer instructions on every aspect of HTML. Links to additional Web-based resources about HTML and other related

aspects of preparing files are provided at the end of the guide. It gives detailed information about how to use HTML for great effect.

2.6.2.2   Sites on Developing Process.

http://www.med.monash.edu.au/informatics/techme

This site touches on the developing processes where we can learn more technical stuff about developing process of a system. It goes through all the related aspects of developing and gives the users an insight and a walk through the processes involved.

2.6.3 Survey .

A survey was conducted in Sekolah Rendah Kebangsaan St. Anthony, Teluk Intan (SASTI). Although a short notice was given to them, the Headmaster, the teachers and the student were very helpful in making these survey a success. The purpose of these survey is to better understand the needs and problems faced by the targeted audience. A casual interview with the teachers who teach mathematics for the UPSR students helped to shed some light on the matter of relaying knowledge of mathematics more effectively.

A questionnaire was handed-out to three classrooms, one in each Standard from Standard One to Standard Three, comprising of 39, 38 and 40 students respectively. From the results obtained, it could be concluded that mathematics is among the subjects that is both liked and feared by students. The idea of having a computer aided system to help to better master mathematics developed an interest among the students and teachers alike. The teachers on the other hand gave valuable insights on how to

more effectively provide assistance to the students who use the system in a multitude of aspects.

2.7   Relational Development Models.

2.7.1 Waterfall Model.

In a waterfall model the stages are depicted as cascading from one to another. As the figures implies, one-development stages should be completed before the next begins. Thus, when all of the requirement are elicited, analyzed for completeness and consistency and documented in a requirements document, system design activities will be carried out. The waterfall model presents a very high–level view of what goes on during development and it suggest to developer the sequence of events they should expect to encounter. The waterfall model can be very useful in helping developers lay out what they need to do. It is simplicity makes it easy to explain to customer who are not familiar with the systems development, it makes explicit which intermediate product are necessary in order to begin the next stage of development. Other more complex models are really just embellishment of the waterfall model, incorporating feedback loops and extra activities. However, there are two major drawbacks concerning the waterfall model. Firstly, it shows how each major phase of development terminates in the production at same artifact (such as requirement, design, or code) and there is no insight into how each activity transform one artifact to another, such as requirement to design. Thus the model provides the guideline to managers and activity that are likely to occur during development secondly the model fails to treat the system as problem solving process.

2.7.2 Prototype Model.

Prototyping model are consider highly useful for developing information technology. There are a number of different names being used to describe similar design development methods including prototyping, rapid application development, rapid prototyping and so on. There are two main categories of prototyping technique as outlined below:

a) Rapid Prototyping

Rapid Prototyping is used to discover flows in a design in a short amount of time. The initial design is tested and corrected then tested and corrected again and so on, until a certain level of satisfaction is achieved. Sometimes prototypes are in a much simpler form than the end product, for example paper can be used to prototype of a screen design. Other names for this technique include rapid application development. The emphasis is on quick, fast, interactive design.

b) Evolutionary Prototyping

Evolutionary Prototyping or software prototyping can be use rapid technique, but the emphasis is more on creating a prototype in software that will (not necessarily rapidly) form the basic of the final product. In a strict sense, once a satisfactory prototype has been created, the project continues on to a more waterfall like method of development. In a reality the stricter software engineering path is rarely followed when creating interactive multimedia. Prototyping technique is very useful in situation where the user interface is of primary importance such as developing information software.

There are problems in prototyping method. At some point the prototyping has to stop, and the project continue. It is important the iteration be managed appropriately, and not coming on into actual development where correcting mistake is difficult and consuming.

2.8   Relational Authoring Tools and Programming Language.

2.8.1 Macromedia Dreamweaver.

In then ensuing search for a Web Authoring tool that is both powerful and easy to use, Dreamweaver has caught the attention of both seasoned beginning Web developers alike. Dreamweaver's visual interface dramatically reduces the initial learning curve and increases efficiency as the production effort begins. One of the aspects of using Dreamweaver is required to create a functional and professional looking multimedia program or a web site.

2.8.2 HTML

Hyper Text Markup Language or HTML for short is generally a markup language. It isn't a high-level language like C or Visual Basic. HTML is read, or interpreted, by a user agent. This user agent is known as Web Browser. HTML's primary use is to create web pages. It is inseparable from the concept and entity referred to as the World Wide Web.

2.8.3 JavaScript

JavaScript may be considered a derivate at the programming language Java. But while both are tools for providing interactive into web pages, but they are different. JavaScript is a simple set of programming instructions that you can enter directly among the HTML formatting of your web pages and code that can be easily accessed and modified. With JavaScript, you can perform many forms of tasks without connecting to a web server. JavaScript allow you to create content that is dynamic, so that the code inside one web pages can produce many different type of display and feature depending on the viewer's actions, including the images that changes when you move the mouse over.

2.8.4 Adobe Photoshop

Adobe Photoshop is image processing software packages that enable us to create and edit images on IBM personal computer. Adobe Photoshop is acknowledged in professional fields as the cutting edge program. With Photoshop's tools we can mix and manipulate colors at the click of a buttons. We can also create pattern, artistic design using fills and color, and manipulate a design images with special effect and technique. Furthermore, we can use it to edit and create images as diverse as commercial art, new photo, motion picture footage and fine art work.

2.9   Evaluation on Existing System.

2.9.1 Web-based Learning

2.9.1.1   Andes-An Intelligent Tutoring System for Physics.

An existing system that is chosen to be both a guide and object of study is the Andes-An Intelligent Tutoring System for Physics. To increase the learning of the participating physics students by making more effective use of the time they spend studying examples and solving problems. To advance our understanding of how students learn difficult and sometime counterintuitive subjects such as physics by studying how different styles of tutoring change students' learning processes and outcomes. To advance the state of the art in Intelligent Tutoring Systems by finding methods for teaching fundamental concepts (e.g., acceleration, velocity, force, energy, momentum) in the context of their application, and methods for teaching students more effective learning habits. This system is divided into several components. They are the:

The Homework Assignment Editor.

This program is used by instructors to create homework assignments.

The Tutor.

This program is used by students to do their homework. It consists of the following modules:

-   The workbench. The student selects activities and does them. The workbench includes tools, such as a calculator and an algebraic equation solver. It can give simple right/wrong feedback on both final answers and intermediate results. For lightweight applications, it can be used alone, without the rest of the tutor.

-   The helper. This module tries to understand what plan or goals the student is pursuing as the student does an activity. It offers help when asked, and may sometimes offer unsolicited help. It can explain the feedback given by the workbench. If it detects an important physics misconception or a bad learning habit, it may engage the student in extensive multimedia instructional activities.

-   The assessor. This module uses Bayesian reasoning to maintain a long-term model of the student's level of mastery of individual physics concepts and the student's preferred methods of problem solving and learning. This module builds on OLAE and POLA.

The Author's Tool Box.

These programs enable authors to create or modify the content of individual homework activities and to modify the physics knowledge base.

These system will be a guideline in the development of our own ITS. The contributing modules will be used as a prime example as to how our system will behave and function in concept.

CHAPTER THREE

Methodology

3.1   System Analysis

System analysis is a systematic investigation of a real or well planned system to determine the functions of the system and how they relate to each other and to any either system there is. Having in mind the delicate context and undeniable constraints of the system, developers should be able to clarify the interactive multimedia project rationale to define the scope of the program and to set up methods of evaluation by creating a preliminary analysis.

Among the typical constraints in the design of an interactive multimedia application include:

- Media configuration and performance, e.g developers might have a multi-platform development strategy aimed at producing a good and reliable multimedia application

- For the publishing market, or a very tailored approach for a specific purpose- a teaching and learning tools.

- The availability of expertise about the subject

- The accessibility of related multimedia documentation

- The budget and the deadline

The look and feel along with the interface and functionality of existing interactive multimedia application should be evaluated. It helps to make a lot of comparative feature at existing application. Looking at these applications revealed the puzzle that multimedia design and production represent. Production was governed by the delivery

requirement, hardware limitation, storage capacities and the speed of the programs

that presents the information. The entire existing product analyzed demonstrated the

trade off the developer had to deal with in order to bring the project to perceived

market. The processor speed, the hard disk, storage and access, and memory

limitation have all been handled to create the best application for the investment.

3.2   The Modeling Process and Life Cycle.

3.2.1   What is a Process?

A process is a series of steps involving activities, constraints and resources that

produce an intended output of some kind. A process usually involves a set of tools

and techniques and has the following characteristics:

i.   The process prescribes all of the major process activities.

ii.   The process uses resources, subject to a set of constraints and produces
      intermediate and final product.

iii. The process may be composed as sub-processes that are linked in someway.
      The process may be defined as a hierarchy of processes, organized so that
      each sub-process has its own process model.

iv.   Each process activity has entry and exit criteria, so that we know when the
      activity begins and ends.

v.   The activities are organized in a sequence, so that it is clear when one
      activity is performed relative to the other activities.

vi.   Every process has a set of guiding principles that explains the goals of each
      activity.

vii. Constraints or controls may apply to an activity, resource or product.

When the process involves the building of some product, it is referred to as a life cycle. A life cycle usually involves the following stages:

- Requirements analysis and definition

- System design

- Program design

- Program implementation

- Unit testing

- Integration testing

- System testing

- System delivery

- Maintenance

Below are the reasons for modeling a process.

a) It forms a common understanding of the activities, resources, and constraints involve in a system development.

b) Help to find inconsistencies, redundancies, and a mission in the process and in its constituent parts. As these problems are noted and created, the process becomes more effective and focused on building the final products.

c) The model should reflect the goals or development such as building high quality system, finding faults early in development, and meeting required budget and schedule constrains.

Every development model include system requirement as input and delivered products as output.

3.2.2   Proposed Development model for the ITS.

3.2.2.1   Development models

The above discussion is about the development model and design in the practical way without particular refrence to any interactive multimedia application. The model used for developing the system are mostly with some origins in software engineering technique. There are dozens of different method, some almost identical but developed by different disciplines.

A) Waterfall model

In a waterfall model the stages are depicted as cascading from one to another. As the figures implies, one-development stages should be completed before the next begins. Thus, when all of the requirement are elicited, analyzed for completeness and consistency and documented in a requirements document, system design activities will be carried out. The waterfall model presents a very high–level view of what goes on during development and it suggest to developer the sequence of events they should expect to encounter.

The waterfall model can be very useful in helping developers lay out what they need to do. It is simplicity makes it easy to explain to customer who are not familiar with the systems development, it makes explicit which intermediate product are necessary in order to begin the next stage of development. Other more complex models are really just embellishment of the waterfall model, incorporating feedback loops and extra activities.

However, there are two major drawbacks concerning the waterfall model. Firstly, it shows how each major phase of development terminates in the production at same artifact (such as requirement, design, or code) and there is no insight into how each activity transform one artifact to another, such as requirement to design. Thus the model provides the guideline to managers and activity that are likely to occur during development secondly the model fails to treat the system as problem solving process.

B) Prototype model

Prototyping model are consider highly useful for developing information technology. There are a number of different names being used to describe similar design development methods including prototyping, rapid application development, rapid prototyping and so on. There are two main categories of prototyping technique as outlined below:

a) Rapid Prototyping

Rapid Prototyping is used to discover flows in a design in a short amount of time. The initial design is tested and corrected then tested and corrected again and so on, until a certain level of satisfaction is achieved. Sometimes prototypes are in a much simpler form than the end product, for example paper can be used to prototype of a screen design. Other names for this technique include rapid application development. The emphasis is on quick, fast, interactive design.

b) Evolutionary Prototyping

Evolutionary Prototyping or software prototyping can be use rapid technique, but the emphasis is more on creating a prototype in software that will (not necessarily rapidly) form the basic of the final product. In a strict sense, once a satisfactory prototype has been created, the project continues on to a more waterfall like method of development. In a reality the stricter software engineering path is rarely followed when creating interactive multimedia. Prototyping technique is very useful in situation where the user interface is of primary importance such as developing information software.

There are problems in prototyping method. At some point the prototyping has to stop, and the project continue. It is important the iteration be managed appropriately, and not coming on into actual development where correcting mistake is difficult and consuming.

In the development of the ITS, the model that has been chosen is a combination of the

waterfall model and the prototype model.
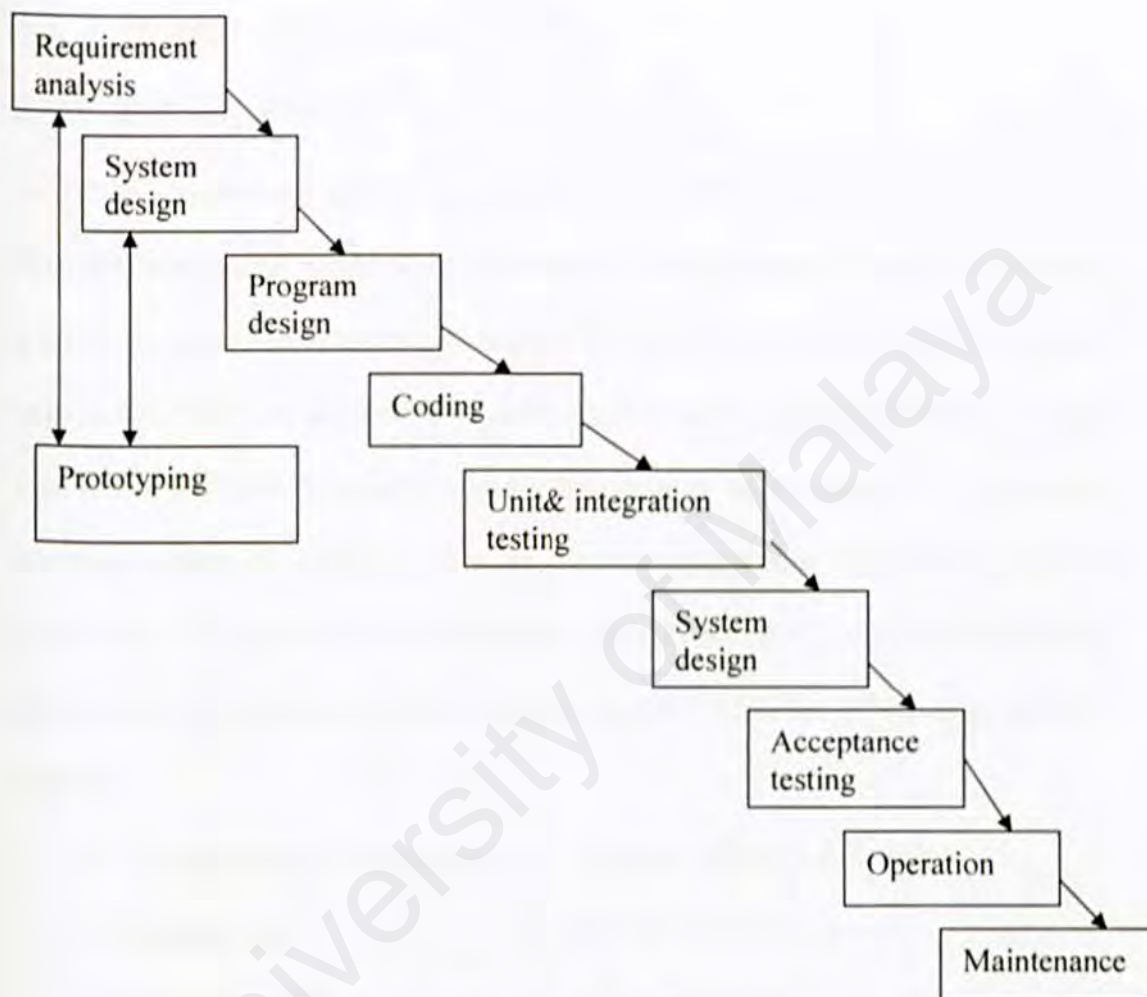
Figure 3.1: The Waterfall model with prototyping

In a waterfall model, each development stage has to be completed before proceeding

to the next. For example, the first stage all the requirement are elicited, analyzed and

documented before designing the system. Overall this model is a well documented

process, with the addition of the prototype model as the sub-process certain aspects of

the system can be reviewed and tested to check its functionality and whether it meet

the specification requirements. This means that process can be tailored to meet the specific requirement yet possibly changing needs of any application. This way major problem can be evaded as errors can be detected at an early stage.

3.3   Delivery Platform and Medium

3.3.1 Delivery Platform

As ITS is a web-based application, the delivery platform would be the World Wide Web. Delivery on the World Wide Web usually side steps many issues of the delivery platform because web browsers all take the HTML (and more) that makes up a web page and display it on the users computer. The web is the multimedia delivery system that works on most computers because the browser takes care of the underlying operating system by hardware. It is an example of document based programming because the web page is a document made to certain standards, which is displayed by any browser that adheres to those standards. Below is the list of relational delivery platform:

    a. Type and speed of processor   - Pentium 366MHz and above

    b. Memory size   - 62 MB RAM and above

    c. Size of hard disk   - 2 GB and above

    d. Operating system   - Windows 98 and above

    e. Access to online system   - Internet, WWW, local network and so on

    f. Speed of network connection   - 56k and above

    g. Resolutions of the screen   - 800 by 600 pixels

    h. Number of colors on screen   - 256 and above

    i. Sound handling   - 8-bit and above

3.3.2 Delivery Medium

Online delivery will be the delivery medium for the proposed ITS system. There are four main issues namely speed of access, distance, updating, and unlimited size of the data space that can be provided online. The speed with which ITS potential users can access the application is unpredictable because it depends on the access speed of the Internet. Online delivery allows people from all over the world to access the application anytime. All they need is a connection to the Internet. This way we can overcome the barrier of time and space. It also provides huge data space that can potentially be presented to the user.

3.3.3 Why web-based learning?

The advantages and disadvantages have been discussed in chapter two. Web-based learning is chosen to develop the ITS for the reasons that has been stated like follows:

- ITS is a learning and teaching application. Therefore there is a possibility that the information on the website and stored in the database could be updated. Updates on web pages can be done easily whereas info on a CD ROM is static and cannot be changed.

- A web-based application is stored in a server that is connected to a network locally or globally, this allows it to be accessed anywhere without the geographical limitations. This has been proven by distance learning programs, which has been introduced by institutions globally. CD ROM applications can only be used if the users can get hold of the particular CD. This means the usage of the application depends on the distribution of the CD.

- With web-based learning, multiple users can access it simultaneously whereby the teacher and the students can experience the interactive learning and teaching environment. One CD can only be used one user at a time unless the application is saved into the computer. This usually takes up disk space.

3.4   Proposed Development Tools.

Given are the tools that will be used. The advantages that are stated are the reason why these tools are chosen.

3.4.1 Authoring Tools.

3.4.1.1   Macromedia Dreamweaver.

The Advantages of using Dreamweaver.

There are many qualities that make Dreamweaver different from other high-end web site tools. Among those qualities are:

- Roundtrip HTML
- Customizing options and page layout power
- Cross-browser compatibility
- Site management features

Roundtrip HTML.

Most traditional web page tools are either tag based good control but difficult to use or have a WYSIWYG interface. Tools with WYSIWYG interface usually create their own brand of HTML that doesn't always conform to the World Wide Web Consortiums HTML Standards. So WYSIWYG tools which shields users from hand

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editing tags, are convenient and quick to use. HTML purist don't like the HTML these tools produce. Another problem occurs if more than one editor is used or the pages is worked on by several people using different editors. The source from one falls to bits or is reformatted when it is opened with another. Dreamweaver's Roundtrip HTML preserves the formatting that we set, no matter which source editor we use.

Customizing Options and Page Layout Power.

With Dreamweaver, many things can be customized such as the look of our workspace, our choice of HTML source editor, or even the way our HTML source is displayed. Among the features of these are:

Launcher - This can be used to open and close Dreamweaver's pallets and inspectors. There's a mini launcher at the bottom right edge of the document window. It has the same icons as the launcher, but no labels. Once we get used to the icons, we can dispense with the launcher, freeing valuable desktop workspace for other items.

Object pallet – This feature reproduces selection within the Insert menu. It is used to insert the page elements. The default groupings for page elements are, *Common,* *Forms* and *Invisible*. Groupings can be customized in almost anyway, from which elements appear in which group to which can be created and added to any group. Objects can be almost any HTML element, such as images, tables, layers, rules, Applets, plug-ins, forms, scripts, comments to snippet of codes. Once a new object is created and added to the object pallet, it can be added to any page.

Cross-browser compatibility.

Dreamweaver has several features to make this essential task easier. A target browser or browser can be selected. Check a document against the target(s) and a list of tags and / or attributes that are not supported by the target browser(s) will be displayed.

Predefined profiles for Netscape Navigator 2.0, 3.0, and 4.0 and Microsoft Internet Explorer 2.0, 3.0, and 4.0, or any combination of these can be checked.

Site Management Features.

Creating a single page is one thing, maintaining a site is another. There are links to check (within pages, within sites, across sites), HTML to polish, and styles to update. Good sites are internally consistent for consistency helps visitors to orient themselves within the site. Changing the way lists are displayed or changing the navigation bar on every page can be frustrating. Dreamweaver's Target Browser Check and CSE HTML Validator (bundled with Dreamweaver) helps to control and manage our HTML. The check Link Feature (from the File Menu) check links for a single document or the entire site.

3.4.2   Programming Language.

3.4.2.1   HTML   .

Since this is a web-based system, HTML is used because it is the language used to specify the construction of web pages.

3.4.2.2. JavaScript.

JavaScript has many advantages. Among them are:

- ➤ Scripts can make the page more immediately interactive, that is, interactive without having to submit every little thing to the server for a server program to re-render the page and send it back to the client.

- ➤ With the help of pop-up list of links, the user with a scriptable browser can bypass one intermediate menu page.

➢ Embedding JavaScript into a HTML page can bring the page to life in any number of ways. The most significant feature are the image roll-overs where we roll the cursor a top a graphic image and its appearance changes to highlighted version.

➢ Interaction forms validation is an extremely useful application of JavaScript. Scripts can examine the validity of the data. Without scripting, a user has to submit the form and let a server program (CGI) check field entry and then report back to the user. Interactive validation scripts can check each form field immediately after the user has entered the data, while the information is fresh in mind.

➢ JavaScript allows a web page to perform "if-then" kind of decisions based on browser version, operating system, user input, and details about the screen size in which the browser is running. But a JavaScript enhanced page can instruct the browser to render only certain content based on the browser, operating system and even the screen size.

3.4.3 Graphics.

3.4.3.1. Adobe Photoshop

Adobe Photoshop is image processing software packages that enable us to create and edit images on IBM personal computer. Adobe Photoshop is acknowledged in professional fields as the cutting edge program. With Photoshop's tools we can mix and manipulate colors at the click of a buttons. We can also create pattern, artistic design using fills and color, and manipulate a design images with special effect and

technique. Furthermore, we can use it to edit and create images as diverse as commercial art, new photo, motion picture footage and fine art work.

3.5   The Requirement Process.

It is very important to capture all the necessary requirements. A requirement is a feature of the system or a description of something the system is capable of doing in order to fulfill the systems purpose. For this project, the requirements were gathered through research on the Internet and books, analyzing on the results from the survey conducted and review the existing system.

3.5.1   Requirement Elicitation.

Requirement elicitation is an especially critical part of the process. A variety of techniques must be used to determine the user's needs and what they really want in the system.

The three categories of requirements are:

- Absolutely must be met

- Highly desirable but not necessary
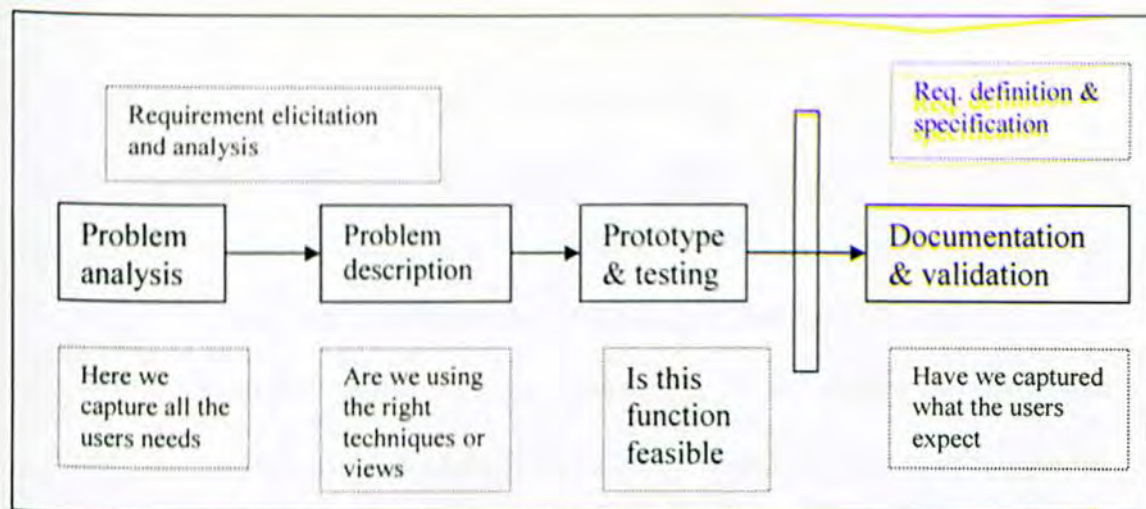
- Possible but could be eliminated

Figure 3.2 The Process of Determining Requirements.

3.5.2.   Requirements For ITS.

The requirements that are needed is basically two:

- Functional requirements

- Non-functional requirements

3.5.2.1 Functional Requirements.

Functional requirement describes an interaction between the system and its environment. It also describes how the system should behave given certain stimuli into sub-modules as mentioned earlier.

Lessons

This is the main sub module of ITS. Apart from providing notes, this program is used by students to do their homework. It consists of the following modules:

- o   The workbench. The student selects activities and does them. The workbench can give simple right/wrong feedback on both final

answers and intermediate results. For lightweight applications, it can be used alone, without the rest of the tutor.

o   The helper. This module tries to understand what plan or goals the student is pursuing as the student does an activity. It offers help when asked, and may sometimes offer unsolicited help. It can explain the feedback given by the workbench. If it detects an important mathematic misconception or a bad learning habit, it may engage the student in extensive multimedia instructional activities.

o   The assessor. This module maintains a long-term model of the student's level of mastery of individual mathematic concepts and the student's preferred methods of problem solving and learning.

3.5.2.2 Non-functional Requirement.

Non-functional requirement describes a restriction on the system that limits our choices for constructing a solution to the problem. It usually narrows our selection of language, platform, or implementation techniques or tools; however, the selection is made at the design stage, after the requirement has been specified. Below are the non-functional requirements:

-   User-friendly

Users should be able to browse without any problem. The system should make users feel comfortable and face no difficulties by having a GUI which will enable users to click their way around easily.

- Attractive Interface

The interface of the system would be very graphical and colorful in order to attract and maintain the student's interest and attention.

- Easy to Navigate

Navigation for the system is made simple as possible. Navigation buttons and icons are either graphics or symbols which is easy to understand.

- Interactive

The most common form of interactivity is clicking on hyperlinks to navigate around the system. An interactive system beats a non-interactive system any day because it can maintain interest and attention.

- User satisfaction

The users should find the system enjoyable to use. They should be fascinated, feel curious and on top of that must feel that the system is really helpful in their studies.

CHAPTER FOUR

System Design

System design is the creative process of transforming the problem into a solution. The description of the solution is also called the design. A system model is a representation of an in-place or proposed system that describes the data flow throughout the structure. The model describes the point where data or information enters a system and the places where it will be processed as well as the actions taken and the points where the data will be on output. Design diagrams include Data Flow Diagrams (DFD), structural charts, decision trees and other such items. For an ITS, Data Flow Diagram and structured charts will be used to model the system. Structured charts will be used to show the outline of the system. Data flow diagram will give the graphical illustration that shows the flow of data and logic within the system. The data flow diagram comprises of four basic symbols:

SYMBOL	NAME	DESCRIPTION
	ENTITY	This is an external entity that can send data or receive data from the system. It interacts with the system but considered as outside of the boundaries of the system.
	Flow of Data	Used to show the movement of data from an origin to a destination with the head of arrow pointing towards the destination.
		It represents the

	Process	transformation or processing of information within a system.
	Data Store	This shows a depository for data that allows additions or retrieval of data.

4.1 Designing The Intelligent Tutoring System.

The design of the ITS is based on all the information gathered which has been explained in the literature review chapter. The content of the system is designed based on the requirements of the end users. Advantage and disadvantage of the existing systems are taken into deep consideration when designing the ITS. Basically, these are the characteristics of the proposed ITS:

- It is user friendly

- It has simple and easy to understand instructions

- Lessons are focused on the topics and sub-topics

- An attractive interface

- And very well organized

4.2   The Systems Structural Design and Data Flow Diagram (DFD)

for ITS.

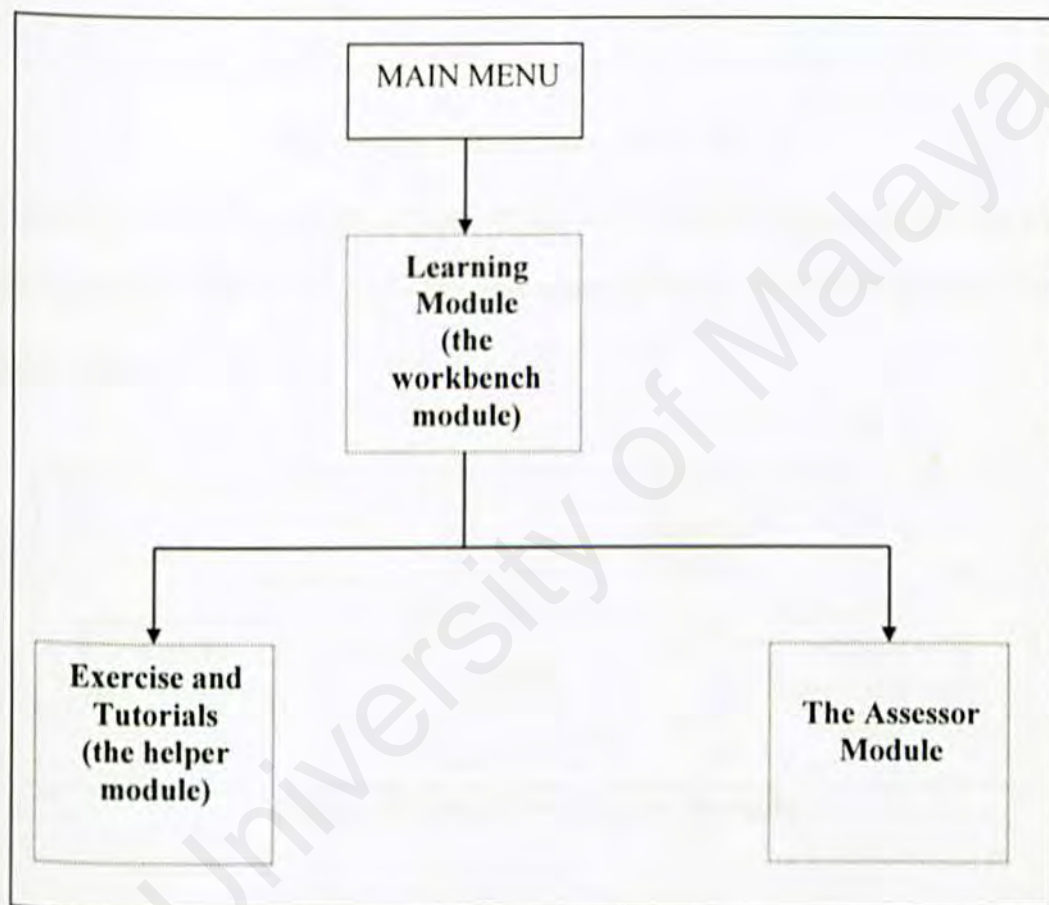*The System Structure Chart.*

Figure 4.1: Main Structural Design for the ITS.

The system consists of the main menu where it hosts the lessons/learning module, the

exercise/tutorial module, and the assessor module. These modules are the links that

the user will see in ITS homepage. Users can click at any link and the site will move

to the selected page.
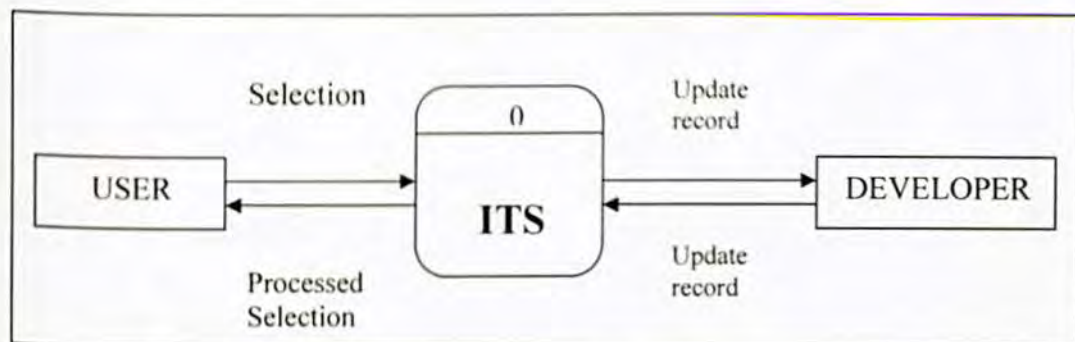
Figure 4.2 : Context Diagram for the ITS

Figure 4.2 shows the context diagram for the ITS. The main entities are the users and

the developers of this site. The ITS processes the user's selection and the updates

done by developers.
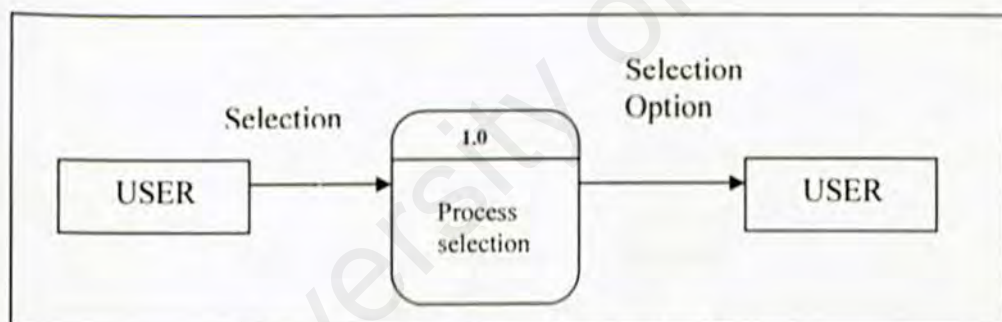
Figure 4.3 : Data Flow Diagram for Main.

Figure 4.3 shows the DFD for the main page of the ITS. The users will be given the

option of choosing between the lessons, the exercises or tutorials in the main menu.

Figure 4.4 Structural Design for Lessons.

As shown on Figure 4.4 above, the lessons are divided into sub-modules that host each topic in the arithmetic section.

Figure 4.5 : Data Flow Diagram for Lessons.

Figure 4.5 shows the DFD of Lessons. When the users select a topic, the system will process the selected lesson and display it to the user.
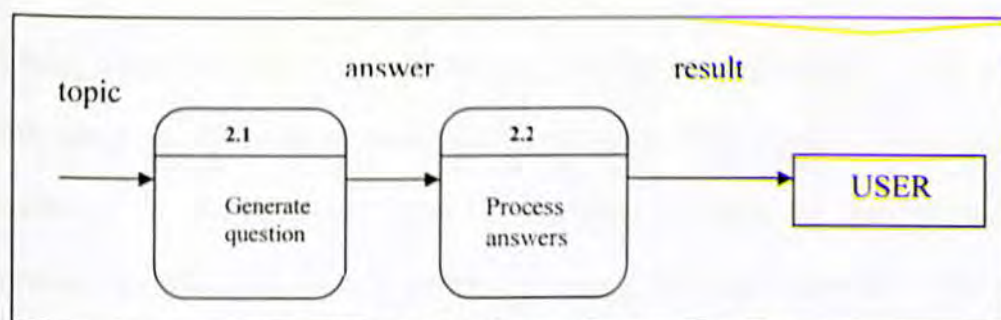
Figure 4.6 : Child Diagram for Process 2.0

When users select a topic, the system will process the selection to verify it. The system will display the selected lesson. At the end of each lesson, 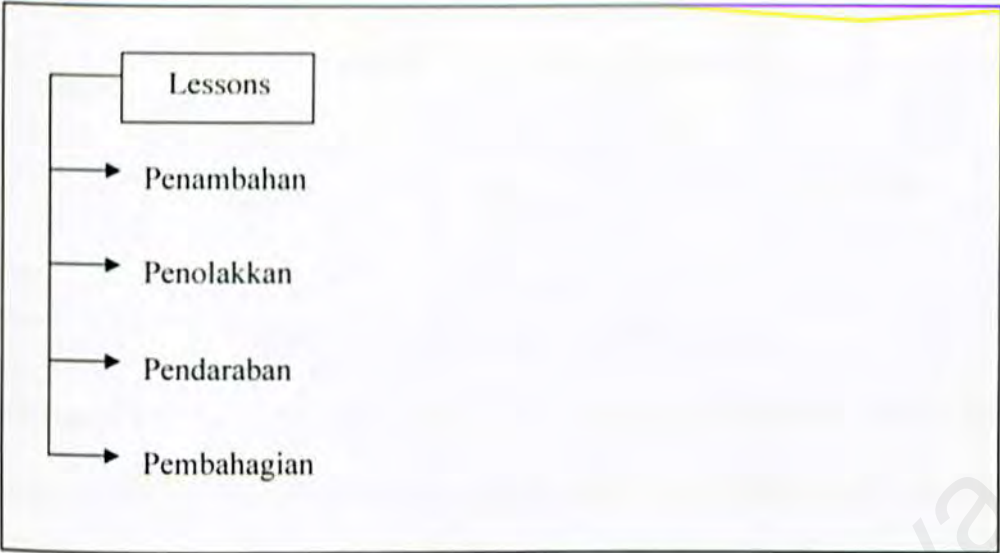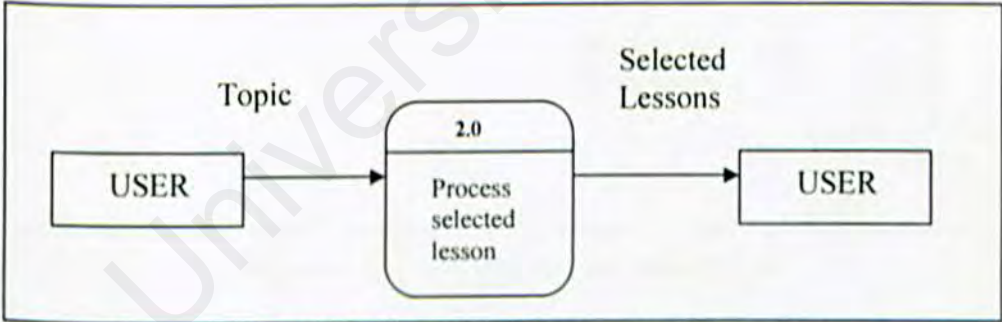users can practice what they have learnt by answering the interactive questions or choose to proceed to the next lesson. Users will start answering the interactive questions by clicking start.
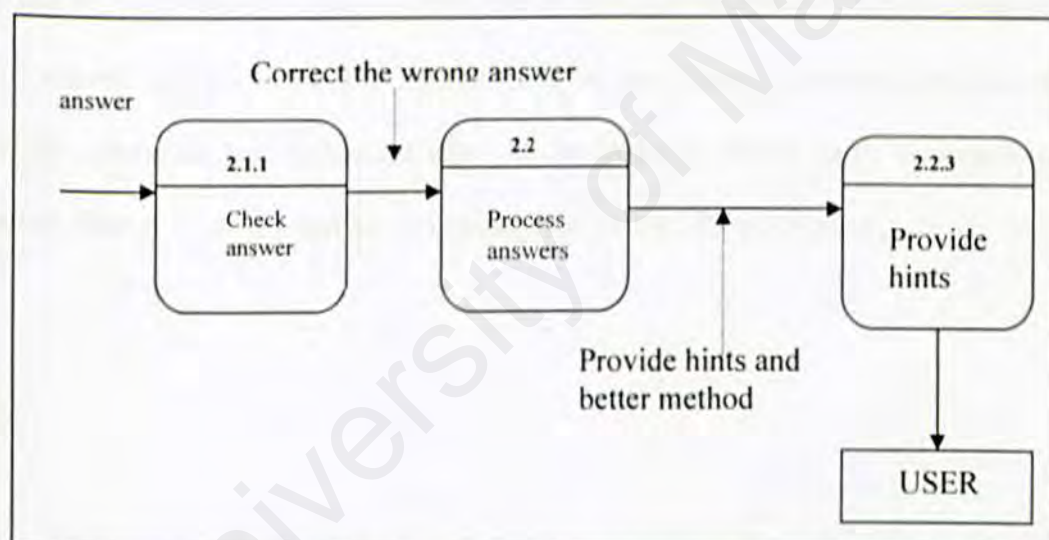
Figure 4.7: Child Diagram for process 2.2

When an answer is given, the system will provide a better way of answering (if there is any) or provide hints on how to answer the question if the given answer by the users is wrong. This is where the system acts intelligent. The user will not be given the right answer straight away but pushed more to figuring out the answers themselves with the help of the ITS. This principle goes to all the exercises, tutorials, and examination models, be it simple or hard.

4.3   Interface Design.

For many users who can't tell the difference, interface is the system. However well or poorly designed, the interface stands as a representation of the system and reflects the competence of the developer. Type of interfaces includes the natural-language interfaces, question and answer interfaces, menus, form-fill interfaces, command-language interfaces and graphical user interfaces (GUI) and the web (WWW- World Wide Web). The user interface has two main components. They are the presentation language, which is the computer-to-human part of the transaction, and action language, which on the other hand, characterizes the human-to-computer portion. Together, both concepts cover the form and cont5ent of the term *user interface*. As the ITS is a web-based learning system for students, the interface would be designed to be colorful and attractive. The interface will be user friendly, attractive and easy to navigate. Graphics and animation that will be included would be at a reasonable amount. This is to ensure that the download time for the ITS is not slow.

CHAPTER FIVE

System Implementation

5.1 INTRODUCTION

System implementation in software development is a process to convert system requirements into program codes. This phase always involves some modifications to the previous design due to the limitations of the programming language used. The initial stage of system implementation involves setting up the development environment. This includes setting up development tools to facilitate the system implementation.

5.2 DEVELOPMENT ENVIRONMENT

5.2.1 IMPLEMENTATION REQUIREMENTS

The server computer hardware requirements are :-

1. A server with at least Pentium 166MHz MMX processor.

2. At least 64MB RAM.

3. Network Interface Card (NIC) and network connection with recommended bandwidth at 10Mbps.

4. Others standard computer peripherals.

The client computer hardware requirements are :-

1. Any compatible PC with recommended at least Pentium MMX processor and 32MB RAM.

The software requirements are :-

1.   Windows NT or Windows 2000 as the client Operating System

2.   Internet Explorer 5.0 or above is recommended as the web browser

3.   Internet Information Server 4.0 as the web server

4.   Macromedia Dreamweaver MX as the web authoring tool

5.2.2 IMPLEMENTATION TOOLS

The tools used to develop the Online Music Store are:

- Macromedia DreamWeaver MX

- Active Server Pages

- Internet Information Server (IIS)

- Microsoft Access 2000

- VBScript

- JavaScript

5.2.2.1 MACROMEDIA DREAMWEAVER MX

In order to design the desired user interface for the Web Based Intelligent Tutoring System, Dreamweaver has been used as it is easy to use and provides a wide range of interface design features.

5.2.2.2 ACTIVE SERVER PAGES

Active Server Pages (ASP) is a programming environment that provides the ability to combine HTML, scripting languages and other components to create powerful Internet applications that run on servers. ASP is also a server-generated page that can call other programs to access databases and serve different pages to different browsers. Typically, the script in the web page at the server uses input received as the

result of the user's request for the page to access data from a database and builds or customizes the page on the fly before sending it to the requestor. ASP is as efficient as writing code directly to server's application program interface.

5.2.2.3 INTERNET INFORMATION SERVER (IIS)

In this system, the Internet Information Server or IIS is an important tool that serves as a powerful access control functionality for web access to files and application on the server. The Internet services are run and managed by using the Internet Service Manager, which is the administration feature provided by the IIS. Properties such as virtual directories, virtual servers and access permissions are configured.

5.2.2.4 MICROSOFT ACCESS 2000

MS Access is used to develop the database for the system. It is an easy to use tool where all the important data concerning the system are stored in a database developed using it.

5.2.2.5 VBSCRIPT

VBScript played an important role in the development of the system as it can put an Internet server to work either by actually storing the data or causing some action to take place on the server based on the information given. VBScript validates data, pricing, initiating data storage and provides impressive multimedia feedback.

5.2.2.6 JAVASCRIPT

JavaScript is used in the development of the system in order to automatically change a formatted date on a web page and also cause a linked-to page to appear in popup window. It also serves as a good tool for validation.

5.3 PROGRAM DEVELOPMENT

Program development involves several stages in order to create the programs needed to satisfy the system process requirements. There are 5 stages involved in program development which are review the program documents, design of the program, code the program, test the program and last but not least, completion of the program documentation. Figure 5.1 shows the stages of the program development.

```
┌──────────────────────┐
│ Review the program   │
│   documentation      │
└──────────┬───────────┘
           │
      ┌────▼──────────────┐
      │ Design the program│
      └────────┬──────────┘
               │
          ┌────▼──────────────┐
          │ Code the program  │
          └────────┬──────────┘
                   │
              ┌────▼──────────────┐
              │ Test the program  │
              └────────┬──────────┘
                       │
                  ┌────▼────────────────────┐
                  │ Completion of the        │
                  │ program documentation    │
                  └──────────────────────────┘
```
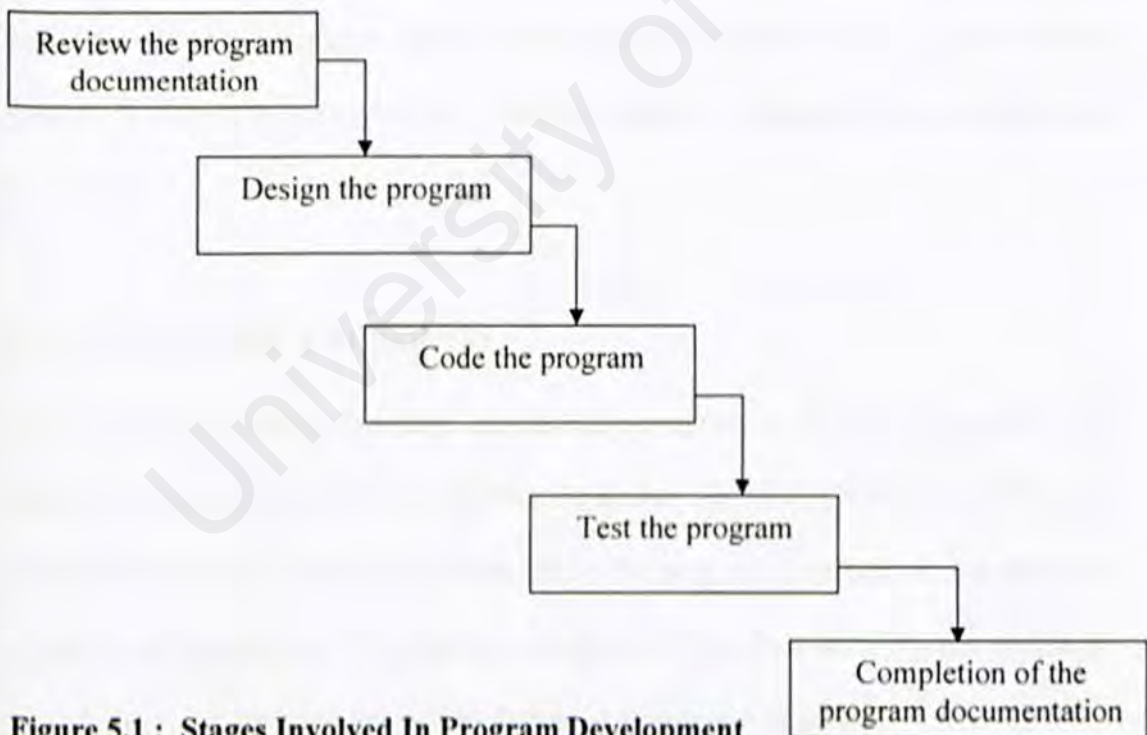
Figure 5.1 : Stages Involved In Program Development

5.3.1 REVIEW THE PROGRAM DOCUMENTATION

The initial step of the program development is to review the previous program documentation. The program documentation of the ITS consists of system description, system requirements and database design. Thus, this makes it more easy for me to understand the task that has to be converted during this coding phase.

5.3.2 DESIGN THE PROGRAM

In this stage, I have decided how the program can accomplish the system requirements by developing a logical solution for the programming problems.

5.3.3 CODE THE PROGRAM

This stage involves the process of writing the program instruction that implements the program design. Design specification must be translated into a proper coding format. If design is performed in a detailed manner, coding can be accomplished mechanically.

5.3.4 TEST THE PROGRAM

This is one of the most important stages in the program development process. This stage is undertaken in order to ensure that the system functions properly by testing the program thoroughly. Testing is a must before the program processes actual data and produces information on which people will rely. I will perform several types of test on an individual program, which will be discussed further in Chaper 6.

5.4 SYSTEM CODING

5.4.1 CODING METHODOLOGY

In the coding phase, two approaches have been used, which are the top-down and the bottom-up approach. Both of these approaches were used to maximize its advantages in developing the ITS.

5.4.1.1 TOP-DOWN APPROACH

Top-down approach is chosen to break the big modules of the ITS into functions and procedures. All these small modules or functions are built and developed separately. Top-Down approach allows the higher-level modules to be coded first before the lower level modules.

5.4.1.2 BOTTOM-UP APPROACH

In contrast with the top-down approach, the bottom-up approach starts coding at the lower level modules before the higher-level modules. The higher-level module acts as an empty shell that calls these lower level modules. The completed lower level module will then be integrated with the newly completed higher-level module.

5.4.2 ASP CODING

ASP coding was used widely whereby files were saved as .asp. ASP coding was used to connect database by using the server map function and full directory path.

```
<!--#INCLUDE FILE="include/odbc.inc" --><%
Login = trim(Request.form ("txtLogin"))
Katalaluan = trim(Request.form ("txtKatalaluan"))

set rs= Server.CreateObject("ADODB.RecordSet")
set my_conn= Server.CreateObject("ADODB.Connection")
my_Conn.Open SourceDSN


   strSql = "Select * from Login where NamaLogin = '" & Login & "' and Katalaluan='" & Katalaluan
& ""
         rs.Open StrSql, my_conn, 2, 3

         if rs.EOF or rs.BOF then
                  response.write ("<font color = black size =5><b><center>")
                  response.write( "Please enter correct Login Name and Password." )
                  response.write("</center></b></font>")%><meta http-equiv=Content-Type
content="text/html; charset=iso-8859-1"><meta http-equiv=refresh content="2;URL=index.htm"><%
Else
         session("Login") = Login %><meta http-equiv=Content-Type content="text/html;
charset=iso-8859-1"><meta http-equiv=refresh content="0;URL=index.html"><%
end if
%>
```

Table 5.1 Server Map ASP Coding

```
<%

name = session ("name")

pass = session ("pass")

Dim objConn

Set objConn = Server.CreateObject("ADODB.Connection")

     objConn.ConnectionString = " DRIVER={Microsoft Access Driver (*.mdb)};" & _

"DBQ=c:\inetpub\wwwroot\maths \maths1.mdb "

objConn.Open

Dim objRS

set objRS = Server.CreateObject("ADODB.Recordset")

objRS.Open "", objConn, , , adCmdTable

%>
```

Table 5.2 Full Directory Path ASP Coding

ASP is also used to send or get information from a page to another by using the post

method functions.

```html
<form name="form1" method="post" action="pelajar_process.asp" Onsubmit = "return
CheckError()">
  <table width="683" border="0" height="400" align="left" cellpadding="5" cellspacing="1">
   <tr bordercolor="#33FFFF">
    <td width="283" height="12" bgcolor="#000066">
     <div align="right"><font color="#FFFFFF" size="3" face="Arial, Helvetica, sans-serif">
      <strong>Name:
      </strong></font><strong> </strong></div>
    </td>
    <td width="377" height="12" bgcolor="#CCCCFF"> <font size="3" face="Arial, Helvetica,
sans-serif">
      <input type="text" name="Nama" size="20">
      </font></td>
   </tr>
   <tr bordercolor="#33FFFF">
    <td width="283" height="5" bgcolor="#CCCCFF">
     <div align="right"><font size="3" face="Arial, Helvetica, sans-serif">
       <strong>Login Name :</strong> </font></div>
    </td>
    <td width="377" height="5" bgcolor="#000066"> <font size="3" face="Arial, Helvetica, sans-
serif">
      <input type="text" name="NamaLogin" size="20">
      </font></td>
   </tr>
<tr bordercolor="#33FFFF">
    <td width="283" height="10" bgcolor="#000066">
     <div align="right"><font color="#FFFFFF" size="3" face="Arial, Helvetica, sans-serif">
      <strong>Password :
      </strong></font></div>
    </td>
    <td width="377" height="10" bgcolor="#CCCCFF"> <font size="3" face="Arial, Helvetica,
sans-serif">
      <input type="password" name="Katalaluan" size="20">
      <strong>(minimum 5 )</strong></font></td>
   </tr>
```

```
<tr bordercolor="#33FFFF">
    <td width="283" height="10" bgcolor="#CCCCFF">
     <div align="right"><font face="Arial, Helvetica, sans-serif">
      <strong>Conformation Password :</strong></font></div>
    </td>
    <td width="377" height="10" bgcolor="#000066"> <font face="Arial, Helvetica, sans-serif">
     <input type="password" name="PengesahanKatalaluan" size="20">
    </font></td>
   </tr>
   <tr>
    <td width="283" height="10" bgcolor="#000066">
     <div align="right"><font color="#FFFFFF" size="3" face="Arial, Helvetica, sans-serif">
      <strong>e-mail:</strong>        </font></div>
    </td>
    <td width="377" height="10" bgcolor="#CCCCFF"> <font size="3" face="Arial, Helvetica, sans-
serif">
     <input type="text" name="email" size="20">
     <strong>(abc@xyz.com)</strong></font></td>
   </tr>
   <tr>
    <td width="283" height="10" bgcolor="#CCCCFF">
     <div align="right"><font size="3" face="Arial, Helvetica, sans-serif">
      <strong>School Name :</strong> </font></div>
    </td>
```

Table 5.3 Post Method Function ASP Coding

Beside that session object was used to store user name and password so that any page
can trace the current user using the system. The session object is used to enhance
secure surfing. Once a current user completes surfing, he would have to logout so that
his profile would not appear again (session abandon).

```
<%
name = session ("name")
pass = session ("pass")
if ((name="")or(pass=""))then
response.Redirect("Index.htm")
else
Dim objConn
Set objConn = Server.CreateObject("ADODB.Connection")
objConn.ConnectionString = "DSN=maths1.dsn"
objConn.Open
Dim objRS
set objRS = Server.CreateObject("ADODB.Recordset")
objRS.Open "maths1", objConn, ,adlockOptimistic, adCmdTable
bol = False
```

Table 5.4 Retrieve Session Object ASP Coding

```
<%
name = session ("name")
pass = session ("pass")
%>
<%
session.abandon
response.Redirect("Index.htm")
%>
```

Table 5.5 Session Abandon ASP Coding

Besides that, ASP is also used in adding, updating and deleting records:-

```
<%
objRS.AddNew
 objRS("Login") = request.Form("Login")
 objRS("umur") = request.Form("umur")
  objRS.Update
 objRS.Close
 Set objRS = Nothing
 objConn.Close
 Set objConn = Nothing
%>
```

Table 5.6 Add New Details ASP Coding

```
<script language="javascript">
<!--
function check() {
var v1,v2,v3,v4,v5,v6,v7;
v1=document.form1.username.value ;
v2=document.form1.pass.value;
v3=document.form1.pass1.value;
v4=document.form1.name.value;
v5=document.form1.address1.value;
v6=document.form1.postcode.value;
v7=document.form1.state.value;
if (v1=="" || v2=="" || v3=="" || v4=="" || v5=="" || v6=="" || v7=="" )
{   alert ("WARNING \n Enter values in all fields") ;
return false   }
else if(v2 != v3)
{
alert("Both Passwords Does't Match")
return false   }
else
{
document.forms[0].submit();
}
}
//-->
</script>
```

Table 5.7 JavaScript Validation Check Coding

```
<script language=vbscript>
sub getme()
result=window.event.keycode
result=chr(result)
if(isnumeric(result) or result=" ")then
msgbox "Enter Only Alphabets",,"Warning"
document.form1.name.value =""
end if
end sub
</script>
```

Table 5.8 : VBScript Validation Coding

5.5   THE FLOW OF THE SYSTEM.

Shown below is the basic flow of the system that has been implemented :-
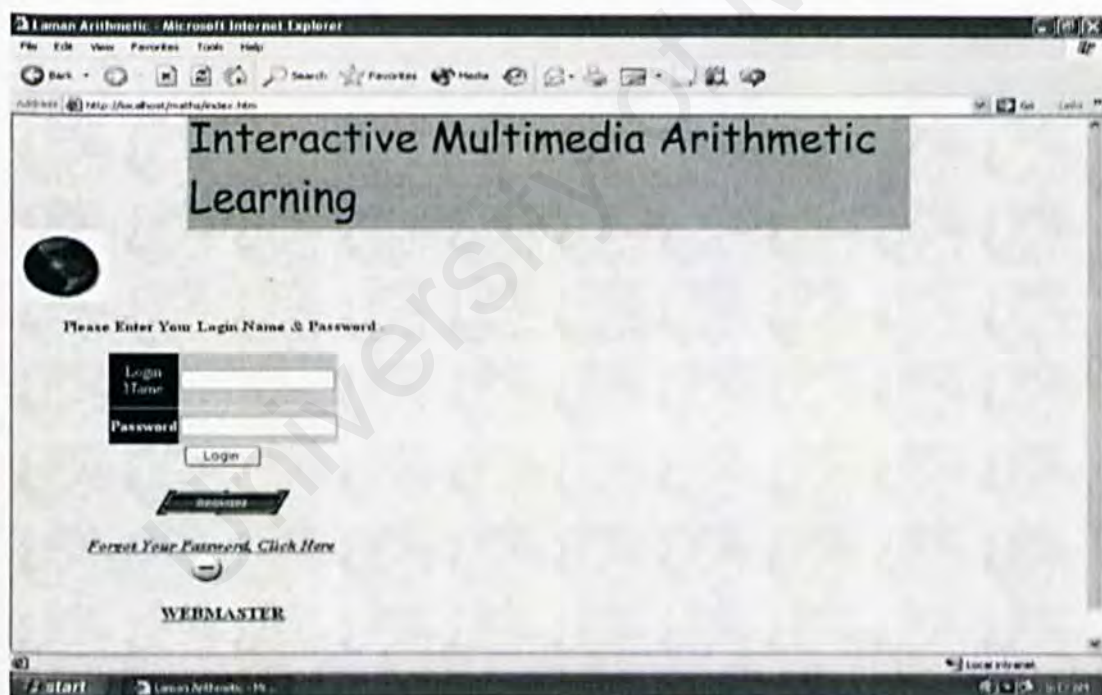

Figure 5.2 : The ITS Main Page

This page potrays the links to the admin page, password retrieval and to register.
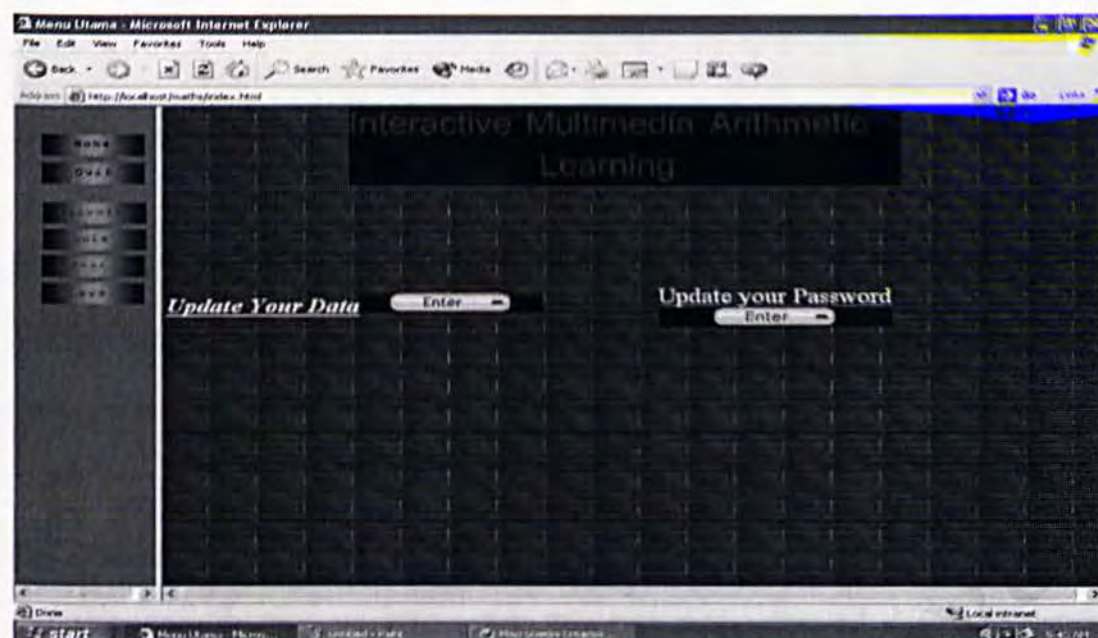
Users can proceed to other modules from here.

Figure 5.3 User Menu

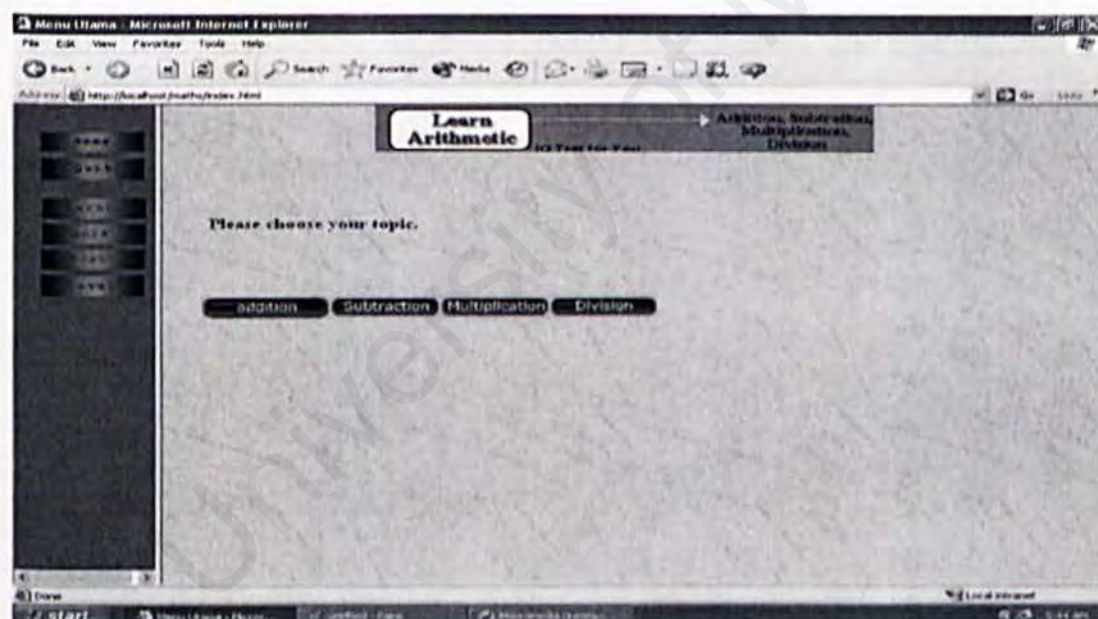This page lists all the links to pages like quiz, tests, learning and more.

Figure 5.4 : The Learning Page.

This figure above shows the learning page with its links.

Figure 5.5 : The Quiz Page

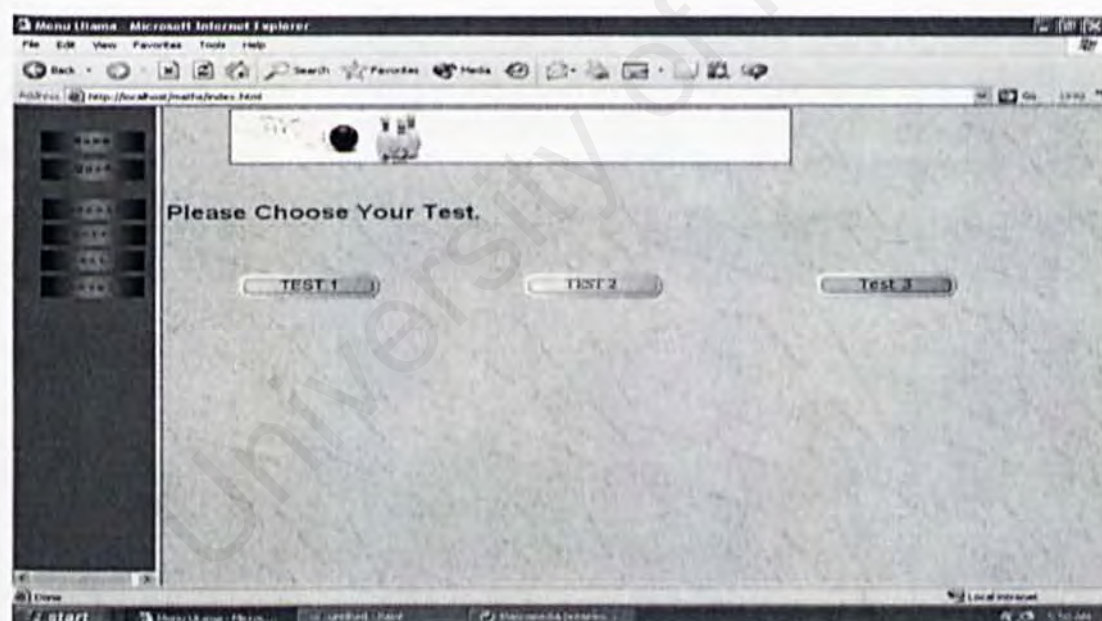The figure above shows the quizzes for given topics .

Figure 5.6 : The Test Page

Figure 5.6 shows the links to a series of tests.

Figure 5.7 : User Registration Page

The user registration page would enable users to register themselves in order to access
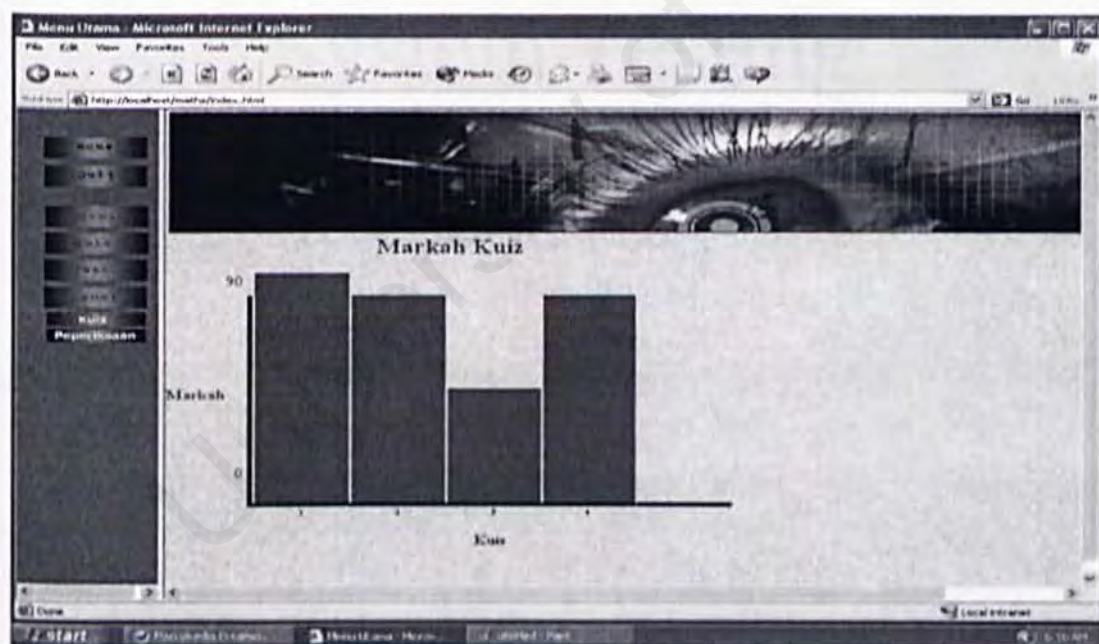
the system.

Figure 5.8 : User's Results Page

This figure shows us the results page of a taken quiz where the performance of the
user is presented in the form of a graph.

CHAPTER SIX

System Testing

6.1 INTRODUCTION

One of the main functions of testing is to establish the presence of defect in a program. Another reason would be to judge whether or not the program is usable in practice. Nevertheless, testing can only demonstrate the presence of error and it cannot show that there is no error in the program. Therefore, suitable approach must be chosen to reduce the possibility of error in a program. Among the rules that serve well as program testing objectives are :-

- Testing is a process of program execution with explicit intents to find errors and run-time program bugs.

- A successful test is also not one that uncovers only few expected error, but it is which constantly provides new challenges to its programmers over time.

- An effective test case is one that contains unexpected testing record sets with high probability of detecting undiscovered errors during the program design and development phase.

The tester is usually not the system designer himself. A number of users are given the opportunity to try the system so as to trace any unforeseen errors or misunderstanding before the system is implemented. The tester has to ensure each module is running smoothly and each function is performed perfectly. Therefore asking the tester to try out the system will test the usability of the user interface, whether the interface is self-explanatory or not, or whether the tester know what should be the steps taken to run the system. If the tester feels uneasy or confused while testing out the system, the user interface should be revised and improved. Advice that is asked from the tester is to improve the usability of the interface.

The difference between testing modules during the development phase and testing them during software integration is that error can be fixed as they are found, the integration phase must be recorded and the bugged module must be returned to its development team or programmers for further correction based on its errors logs. The Web Based Intelligent Tutoring System has gone through three stages of testing before it is completed. These three stages are the component testing, integration testing and acceptance testing.

6.2   THE TESTING PROCESS

In general, the testing process of the Web Based Intelligent Tutoring System can be modeled as below.

Figure 6.1 : Testing Process

The testing procedure usually starts from component testing. This is to ensure that the codes implemented in the system will properly fit the system requirements. This is followed by the integration testing, which is tested for the overall functionality and performance of a few modules that are integrated together. Last but not least, the users are required to test the system very carefully to ensure that the implemented system will function according to its requirements. If any mistake or defects are discovered at

any stage, the previous stages may have to be repeated for correction and modification.

6.3   TESTING APPROACH

The testing approach adopted in the Web Based Intelligent Tutoring System is the bottom-up approach. Using this approach, each of the modules at the lowest level of the system hierarchy are tested individually. The following module to be tested is the module that calls the previously tested module. This approach is followed repeatedly until all modules have been tested.

6.4   COMPONENT TESTING

The details of how each stage takes place in the Web Based Intelligent Tutoring System are described in the following sections.

6.4.1 UNIT TESTING

Unit testing is where testing is done on individual components of the system to ensure that they operate correctly. Each component of the system is tested independently, without other system components. Unit test is very time-consuming and labor intensive stage of any software development. Several techniques have been used in the unit testing for the Web Based Intelligent Tutoring System:-

6.4.1.1 CODE DIFFER IN COLOUR

By using the Macromedia Dreamweaver MX, the code will be in different color. For instance, JavaScript codes will be in red color and ASP codes will be in grey. If the code contains errors, it will appears in bright yellow.

6.4.1.2 CODE REVIEW

Before the function is run in the browser, codes are reviewed line by line to discover any syntax error as well as semantic error. If errors are discovered, they are corrected immediately.

6.4.2 MODULE TESTING

Module testing is implemented after the unit testing stage to uncover error in each unit. A module is a collection of dependent components. During this stage, all the related units or functions will be integrated and tested in the module level. In performing module test, different test cases are applied to the module and the test results are recorded. If errors occur in this level, each unit will be retested till there is a solution to the problem. This is done because although each sub module performs its task correctly, the end result produced may be incorrect when all the sub modules work together.

6.4.3 INTEGRATION TESTING

6.4.3.1 SUB-SYSTEM TESTING

The sub-system testing is done after the module testing whereby the entire module would be integrated and tested further. The sub-system testing is done to check the functionality of the integrated modules. The most common problems that arise when modules are integrated together are module interface mismatch. Therefore, the main concern in integration test is to exercise the interface repeated to defect any interface mismatch problem. Several important aspects are checked to reduce the possibility of interface problem as listed below:

- The necessity to perform a checking that redirects the user to the correct module

- Whether the type of parameter tallies with the type of parameter received

- Whether information passed is sufficient for the receiving module to perform its task

- The necessity of the type conversion.

6.4.4 SYSTEM TESTING

The system testing process is concerned with finding errors, which result from anticipated interactions between sub-systems and system components. It is also concerned with validating that the system fulfills the functional and non-functional requirements. System testing can be categorized into a few types :-

6.4.4.1 STRESS TESTING

This is to determine that the program fulfills the requirements defined for it. It is equally important to ensure that the program works as it should under extreme conditions. In order to perform stress testing, execute the system in a manner that demands resources in abnormal quantity, frequency, or volume.

6.4.4.2 PERFORMANCE TESTING

For real-time and embedded systems, software that provides required function but does not conform to performance requirements is unacceptable. Performance testing is designed to test the run-time performance of a software within the context of an integrated system. Performance testing occurs throughout all steps in the testing process.

6.4.5 ACCEPTENCE TESTING (USER TESTING)

Acceptence testing or user testing is the final testing procedure in the Web Based Intelligent Tutoring System whereby users will be actively involved in testing system to ensure that the system meets their requirements. The main purpose of this testing is to verify whether the system has fulfilled the user's requirements. Besides that, the functionality of the system is demonstrated to the end users and the users are given the chance to experience and explore the system themselves.

6.5   CONCLUSSION

At the end of the testing phase, the system should be able to perform the task required and free of most errors. The user should use the system. However, there are still some critical problems and errors which would occur only after using the system for some time. Therefore, work of testing should not just end in this phase but have to done every now and then to make sure the system functions well.

CHAPTER SEVEN

System Evaluation

7.1   INTRODUCTION

In general, there were quite a number of technical and non-technical problem encountered during the development stage of the Web Based Intelligent Tutoring System. However, most of the problem were detected and resolved eventually. In this phase, the Web Based Intelligent Tutoring System will be evaluated to identify its total strengths and limitations. Evaluation is related to user environment, attitudes, information priorities and several other concerns that are to be considered carefully before effectiveness can be concluded changes and current enhancement will be stated as a reference. Besides that, proper recommendations and proposal would enhance system's performance and functionality in the future after being implemented.

7.2   PROBLEMS ENCOUNTERED AND SOLUTIONS

7.2.1 WEB PAGE CODING

Problem

Generally the problem in web page coding revolved around the programming languages that were chosen to develop the Web Based Intelligent Tutoring System that is ASP, HTML coding, VBScript and JavaScript programming. The difficult part was however to understand Active Server Pages which was very crucial in developing the system. However, most of the coding and scripting problem was encountered in the early stage of the project development. This is due to the ambiguity and lack of understanding in the early stage.

Solution

The solution to overcome is to adopt a divide-and-conquer approach by first concentrating and understanding the basic concepts of the programming languages chosen. This was done by reading books and resources from the Internet and also applying it, encountering errors and eventually overcoming those errors. As the development of the project went on, the understanding gradually built up and most of the problems encountered in the earlier stage were overcome easily.

7.2.2 TOOLS AND LANGUAGE SELECTION

Problem

E-learning is still quite new and has a lot of room for improvement in the cyber world and is developing everyday. The question that aroused at the beginning stage of developing the Web Based Intelligent Tutoring System was are the tools chosen appropriate. Thus it was quite a problem in determining which tools and programming languages would best fit in developing the system because each of them would have its strengths and also weaknesses.

Solution

To overcome this problem, an in-depth study and research on the programming languages and tools were conducted in the early stage of the development. The studies and research activities include Internet surfing, reference books and reviewing the current systems in the market.

7.2.3 DETERMINING SYSTEM SCOPE

Problem

Without experience in web-based development, it is difficult to define the scope of the system in the early stage of developing the system. Due to the insufficient knowledge and time constraint, it is quite impossible to build a full-scale complete system within the given time frame.

Solution

In order to overcome this problem, reference and analysis on current web sites had been conducted in order to understand the system design of each web site and try to adopt some of the ideas into the system design of the Web Based Intelligent Tutoring System.

7.2.4 Intelligent Module Implementation

Problem

This was quite a problem when developing the Web Based Intelligent Tutoring System because to install a working and fully functional system was very hard because of its magnitude and sheer complexity.

Solution

As to search for a solution, constant research and knowledge from every trial and error in the programming would be valuable in order to construct a fully functional and effective system.

7.3   SYSTEM STRENGTHS

7.3.1 GRAPHICAL USER INTERFACE SIMPLICITY

The interface of the Web Based Intelligent Tutoring System is designed to enable users to explore the site with ease. The Web Based Intelligent Tutoring System which is enhanced with a graphical user interface can be said to be a very easy to use system. Users are assisted by proper guidelines and instructions. Links and buttons are named appropriately with simple words so that users will not have problems understanding it. The Web Based Intelligent Tutoring System is further enhanced by enabling minimal input by users so that it wouldn't burden them. Considering the fact that a lot of users might just be at a beginner or intermediate stage in web literacy, the Web Based Intelligent Tutoring System has been designed with simple and user friendly navigation.

7.3.2 INSTANT ERROR MESSAGING

The Web Based Intelligent Tutoring System is designed in such a way that if a user inputs incorrectly, an error message would appear instantly. This would enable the user to identify his/her mistakes and make the appropriate corrections to it.

7.3.3 EASY TO USE WEB SYSTEM.

The Web Based Intelligent Tutoring System is very easy to use. With this, users will find it very easy to navigate through, learn, test their self, and know where they stand performance wise.

7.3.4 ADMINISTRATOR SITE EFFICIENCY

A module for the system administration was developed in order to enhance the administration of the site. With this module, the administrator can easily add new quizzes, update and delete existing records and questions for the tests, and update the notes. The administrator site is a user-friendly and can be used with ease.

7.4 EVALUATION BY END USERS

As the Web Based Intelligent Tutoring System or ITS is proposed to make the learning of arithmetic's more effective and fun, the final stage of system development which is system testing focused on receiving feedback from users in order to judge the correctness of these functionalities, precise data flow as well as enhance interface of the system.

Considering the fact that the scope of the Web Based Intelligent Tutoring System is large, development was carried out with the objective to cover the scope briefly, or in other words the whole system was developed quickly to have the overall structure and potential of the system but the system was not refined to show its full efficiency.

The overall feedback from the end users is good and the Web Based Intelligent Tutoring System is expected to serve the targeted group well after refining.

7.4.1 HOW THE WEB BASED INTELLIGENT TUTORING SYSTEM WAS TESTED

There are 3 main criteria of testing by the user:

- Functionality (50%)

Basic function of a e-learning site which includes notes, personalized tests, and others. Others supporting features are lots of information in the particular field of learning.

- Usability (30%)

A good learning site is one that bundles comprehensive functionality while managing to maintain a simple graphical interface. For brisk operation on a slow connection, the interface should not be overloaded with graphics. Moreover, navigation should be enhanced by clearly displayed input options.

- Accessibility (20%)

The system which is web based should be able to be accessed at anytime of the day. Accessibility also covers part of the security features that have been included in order to make sure that all functions are valid. This would include user registration and login functions.
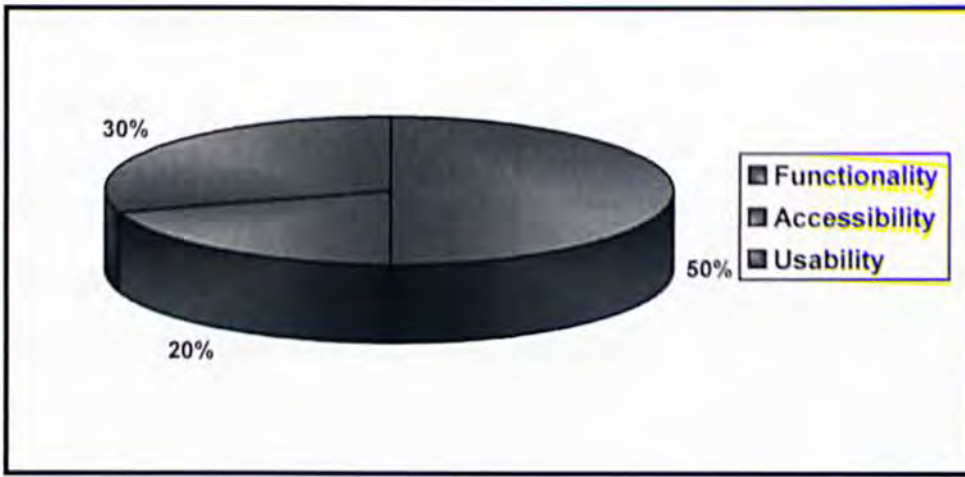
Figure 7.1 User Evaluations

7.5   SYSTEM CONSTRAINTS

7.5.1 PLATFORM AND BROWSER LIMITATIONS

The Web Based Intelligent Tutoring System or ITS is developed based on Microsoft technology, thus the implementation is totally dependent on Windows as the operating system and Internet Explorer as the web browser. Due to the time constraint and technical knowledge, they system cannot perform properly under other operating systems, such as Linux. The Web Based Intelligent Tutoring System web page will not be displayed properly under other browsers such as Netscape Communicator.

7.6 FUTURE ENHANCEMENTS

7.6.1 BETTER INTERFACE AND MORE GOODIES FOR USERS

In the future, a better interface would be presented and the website should offer a lot more in terms of quality, quantity and a higher level of interactivity.

7.6.2 BETTER IMPLEMENTATION OF THE INTELLIGENT MODULE.

A better and more reliable intelligent module for the users should be presented in order to capture interest and to ensure satisfaction and content. The user should be interacting with the system and incidentally, learn better.

7.6.3 GENERATE REPORTS FOR MANAGEMENT PURPOSES

The Web Based Intelligent Tutoring System (ITS) should also incorporate reports that are generated for management purposes. The reports would include students performance reports, records, error logs and so on. Reports should be printable for record keeping purposes.

7.6.4 ADVERTISEMENT SERVICES

Advertisement services should be included in the site in order to obtain more income. Advertisements should be part of the Intelligent Tutoring System web site, just like what we see in other websites nowadays.

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