DEVELOPMENT OF AN INTERACTIVE ENVIRONMENT
FOR INTERNET BASED LEARNING

A THESIS
SUBMITTED TO THE GRADUATE FACULTY
in partial fulfillment of the requirements for the
degree of
MASTER OF SCIENCE

By
CHOON-GUAN LIM
Norman, Oklahoma
2001
DEVELOPMENT OF AN INTERACTIVE ENVIRONMENT
FOR INTERNET BASED LEARNING

A THESIS APPROVED FOR THE
SCHOOL OF AEROSPACE AND MECHANICAL ENGINEERING

BY

________________________
DR. KURT GRAMOLL (CHAIRPERSON)

_______________________
DR. HAROLD STALFORD

_______________________
DR. JAMES E GARDNER
ACKNOWLEDGEMENT

I would like to express my utmost appreciation to my advisor, Dr. Kurt Gramoll, for his guidance, mentoring, support, and assistantship. Without which, this thesis and research project would not have been made possible. His charismatic leadership, excellent management and technical skills never cease to astonish me, and I am very honored to have the opportunity to work under his tutelage. I also wish to express my sincere gratitude to Dr. Harold L. Stalford and Dr. James E Gardner for serving on my advisory committee.

I am grateful to my colleagues at the Engineering Media Lab and friends for their never-ending support and help. My sincere thanks to Julian Yew, Keith V. Adolphson and Ruijin Cheng for being very wonderful project partners. Also, special thanks to Qiuli Sun for his advice on Lingo debugging.

Most importantly, a very heartfelt thank you to my family who has always been supporting me, especially my mother, Sng Heng Muay. In addition, I give thanks to my girlfriend Liqin Zhu, for her continuous love and support when research and thesis writing seems to go on indefinitely.
# TABLE OF CONTENTS

ACKNOWLEDGEMENT ................................................................................................ IV

LIST OF TABLES ............................................................................................................. X

ABSTRACT ...................................................................................................................... XI

CHAPTER 1: INTRODUCTION ....................................................................................... 1

1.1 Online Education Technology .................................................................................. 2

1.2 Assessment of Needs ............................................................................................... 4

1.3 Objective of Research ............................................................................................. 6

CHAPTER 2: LITERATURE REVIEW ............................................................................ 9

2.1 Online Distance Learning Technologies ................................................................... 9

2.2 Interactive Environment .......................................................................................... 12

2.3 Online Distance Learning Instructional Course Website ....................................... 16

2.3.1 Course Management Software ......................................................................... 16

2.3.2 Course Website ................................................................................................ 19

2.4 Traditional Classroom ............................................................................................. 23

CHAPTER 3: OVERVIEW OF EMET ............................................................................ 25

3.1 Purpose of EMET ................................................................................................... 25

3.2 Overview of Design ................................................................................................. 26

3.2.1 Concept ............................................................................................................. 28
LIST OF FIGURES

Figure 2.1. Example of 3-D virtual reality over the Internet ........................................ 11
Figure 2.2. BlackBoard interface ................................................................................. 17
Figure 2.3. Different Course interface at SmartPlanet ................................................. 20
Figure 2.4. Headlight.com interface ............................................................................. 22
Figure 2.5. Interface created by different companies ...................................................... 23
Figure 3.1. Example of the Concept page ..................................................................... 29
Figure 3.2. Example of Case Study – History Class ...................................................... 31
Figure 4.1. Breakdown of Tutorial section ..................................................................... 35
Figure 4.2. Illustration on how to enter skill ................................................................. 36
Figure 4.3. Flowchart to illustrate how an skill functions .............................................. 38
Figure 4.4. Flowchart to illustrate how the Quiz section function ................................. 40
Figure 5.1. Six Cast libraries ......................................................................................... 46
Figure 5.2. Dialog Box - Final version ........................................................................... 49
Figure 5.3. Dialog Box - Version 1 ................................................................................. 50
Figure 5.4. Dialog Box - Version 2 ................................................................................. 50
Figure 5.5. Dialog Box - Version 3 ................................................................................ 51
Figure 5.6. Question Interface ....................................................................................... 52
Figure 5.7. Property List ................................................................................................. 53
Figure 5.8. Response Box .............................................................................................. 54
Figure 5.9. Additional Information Box .......................................................................... 55
Figure 6.1. Macromedia Director Interface .................................................................. 57
Figure 6.2. Illustration of SQL usage ............................................................................ 61
Figure 6.3. Microsoft Access interface ......................................................... 62
Figure 6.4. Macromedia Flash interface ....................................................... 64
Figure 6.5. Macromedia Dreamweaver interface .......................................... 66
Figure 6.6. Adobe Photoshop interface ......................................................... 67
Figure 6.7. Demonstration on the filter capabilities of Adobe Photoshop .......... 68
Figure 6.8. SnagIt interface ........................................................................ 68
Figure 6.9. Output properties of SnagIt .......................................................... 69
LIST OF TABLES

Table 3.1. Layout plan for EMET project ......................................................... 26
Table 3.2. Concepts and Tools covered in EMET .............................................. 27
Table 4.1. Content of the Dreamweaver Tutorial Section ................................. 41
Table 4.2. Content of the Photoshop Tutorial Section ..................................... 42
Table 4.3. Content of the Sound Tutorial Section ........................................... 43
Table 4.4. Content of the FreeHand Tutorial Section ...................................... 44
Table 5.1. List of Cast library ........................................................................... 47
ABSTRACT

Online distance learning has now been available to the general public for a number of years. Currently, besides universities, there are also private organizations creating course websites and online universities. These sites offer a large variety of courses, ranging from management to technology. Since these courses are conducted through the Internet, they are always available regardless of time and location. However, the contents of the mentioned course websites target a broad audience, which does not quite fit the needs of individual groups. Additionally, creating an engaging interactive learning environment is a major challenge for training designers.

In order to attain an interactive learning environment, the Engineering Media Lab of the University of Oklahoma, funded by Hitachi Foundation, developed the Electronic Media Education for Teachers (EMET) website. This website is design according to the need of a group of targeted audience. It teaches, in an interactive learning environment, common multimedia web authoring tools to K-12 and votech teachers. The contents taught in this website is selected according to the needs of these teachers. As this website is created for online use, it provides an asynchronous learning environment for the teachers. The teachers can learn and progress according to their individual needs and desires.

EMET has many common features similar to other websites, such as bookmarks, a note pad and a message board. Other than these features, it also includes three innovative sections, namely Concepts, Tutorial and Case Study. These sections deliver multimedia information and assist the teachers in their learning process. The main
objective of this thesis focuses on the Tutorial section, which provides users with an interactive learning environment.

Each Tutorial section is divided into basic and advanced simulations. These are further subdivided into five skills for each simulation. In each skill, an interactive learning environment is encountered. Capabilities of software like Adobe Photoshop and Macromedia Freehand, are mimicked using Macromedia Director. Tutorials are then posted on the web to allow users to access them to complete the courses. Because of the mimicking capabilities of Director, users do not need to buy or install any program on to their local computers to learn the software.

At the end of each skill, users are prompted to take a quiz to test their newly acquired knowledge. An explanation is immediately generated for the users after they have answered the question. This explanation helps users to understand the software better. The quiz scores are sent to a database and recorded for the users’ future reference.
CHAPTER 1: INTRODUCTION

The coding language, HTML for the World Wide Web (WWW) developed by Tim Berners-Lee is less than 10 years old [1]. Ever since then, educational institutions, research centers, commercial sectors and government agencies have gotten connected to the Internet. Today, there are numerous websites created by companies, government sectors, research centers and universities. These websites, in general, provide information, and promote companies’ products and services to the general public. Additionally, there is another category of websites that is growing at an enormous rate. These websites were created for the purpose of online distance learning.

According to a recent survey from the U.S Department of Education’s National Center for Education Statistics (NCES), the number of distance education degree programs has increased by 72 percent [2]. Furthermore, another 20 percent of institutions have expressed intentions to establish distance education in the next three years. The survey estimated that in 1997-1998, there were more than 1.6 million students enrolled in distance education programs and the enrollment is much higher today. Online distance education websites are not only setup by universities, but private companies are also one of the key players in this market. At the present moment, there are approximately 10,000 distance learning courses on the World Wide Web [3] and these sites are proliferating at a tremendous rate.
1.1 Online Education Technology

The nature of the working environment is shifting from a product-based economy to a knowledge-based economy [4]. There is an increment in the number of people returning to school to acquire new skills. This creates a number of problems. The class size gets too large and the students to instructor ratio are high. Hence, there is a great decrease in interaction between the students and the instructors [5]. The schedules provided by the institutions are usually inflexible and a course usually takes 3 – 5 months to complete. Any participant who is unable to attend due to health, personal, or job related reasons will miss a major portion of the course. Also, the cost of the course and books used in it are expensive. Furthermore, some students need to travel a distance to attend the classes. This incurs a waste of time on transportation. Moreover, there is also a shortage of teachers with a good knowledge to conduct technical courses.

Online education technology makes use of the information processing ability of the Internet and caters to the needs of the students. This technology also helps to solve geographical problems between the students and the instructors, without much change in the quality of learning experience [6].

With online education technology, information is posted online and may be accessed at any time. Students do not have to worry about getting the course textbooks and hence, this can save students’ money in buying textbooks and additional materials. Furthermore, updating information for the online courses is easier and less costly as compared to making corrections in printed textbooks. Reprints or correction slips to change a textbook minor mistake involves both money and time. Also, students can get updated information 24 hours a day and 7 days a week from the Internet at any place.
This technology can also help provide a convenient learning environment for instructors and students.

However, there are some shortcomings in this technology. It is extremely time-consuming to develop a course website. Nevertheless, the effort invested is good for many years to come. And once created, updates are relatively easy to accomplish. Furthermore, the information can be easily shared with other instructors that are conducting similar courses throughout the world. If instructors can pool their effort together, the time used will be better justified.

Another problem regarding the online education technology is that, extensive and tedious training is needed in order to learn the software necessary to build a useful website. However, there are many high level authoring, animation, modeling and rendering programs for both Windows and Macintosh platforms computer that have been introduced recently which helps save development time [7]. These programs are user-friendly and intuitive in design. Users are able to learn and use them within a short amount of time.

If the educators can invest a reasonable amount of time into developing and improving the quality of the class websites, students who are visiting them to learn will likely to enjoy their stay. Explaining a complex mathematics concept by presenting animated illustration online or showing a video capture on a science phenomenon to students helps them to understand the concepts easier. It also helps the students to stay interested throughout the semester. Besides, students can also revise the work without the presence of the teachers. Hence, in long run, this will only save the teachers effort and time, and benefit the students as the materials developed can be reused.
1.2 Assessment of Needs

Teachers have always been one of the important factors affecting the learning process of a student. If a teacher is able to clearly explain an idea to students and capture their interest, the students usually perform better in class. Explanations accompanied with pictures or videos are usually more effective than just plain words. Likewise, using media to help present the lesson will keep the student’s interests longer.

Multimedia is a powerful tool that can enhance the teacher’s power of communication within a learning environment and help convey concepts more effectively [8]. It is also an innovative way to share information and motivate learning. As the use of online education technology is increasing and computer costs are dropping [9], this allows more access to students and teachers. When a teacher creates an interesting and useful website, his/her efforts can be shared among the rest of the teachers around the country, or even the world.

Imagine a history lesson being taught with music, animation or even video over the Internet which can be viewed at anytime of the day. Why would students not want to learn from it? A student can review mathematics concepts at their own pace without needing the teachers’ presence. Also, the students can understand how a tornado is formed by seeing the simulated process rather than trying to imagine it based on the description given by teachers in class or waiting to see a demonstration at a science center. Moreover, the teacher can also create interesting quizzes over the web for the students who can then get their results immediately.

All the above will only be realistic if the teachers know how to create a website or the school has budgeted to hire outside technical support staff to do it for them.
Generally, schools are with faced tight budgets, therefore hiring outside technical support staff is not a feasible solution. Training teachers in multimedia is a better long-term investment since teachers learning the skills would benefit themselves.

If it is assumed that training teachers is more feasible, the immediate question will be how to train the teachers. One of the alternatives is to send teachers to attend classes in their nearby educational institution. However, the computer courses schedule conducted by the institution is usually rigid and is held during regular semester. Teachers already have tight schedules due to schoolwork, and might not be able to attend all the classes due to personal, job and health related reasons. Moreover, when the course is over, teachers can only rely on are their class notes which probably contain outdated information. Also, in some parts of the country such as more rural school districts, such classroom training might not be easily accessible.

A more feasible alternative is to let teachers signup for online classes. There are already many websites available providing a number of different courses to the general public. The course websites cover a large topic area, ranging from “Body & Mind”, like memory power, to “Computer & Internet”, like Microsoft Offices software [10]. Teachers can choose to enroll in a course at their most convenient time.

The downside of these online classes is that they incur fees. Similar to tradition courses conducted by educational institutions, these websites are operated by businesses too. Some schools would have difficulties in working out the budget. In addition, the courses focus mainly on the usage of the general population, rather than specifically for the education area.
Furthermore, most course websites do not provide good interaction between the learners and the computer. The learners do not have a chance to operate with the actual program or software during the course unless they have it installed in their computer. Each multimedia software programs usually cost around $100 or more at educational prices. Some course websites even requires the learners to buy books. This extra cost is too costly for many teachers.

After the teachers have completed the course, teachers will face the same problem as what they face if they had taken the class from a nearby educational institution. They have nobody to turn to when they needed help because these website usually do not have “after service”. Getting reference books from a bookstore might be a wise choice to this problem. However, there are many books in the market, as in the case of multimedia software [11]. Buying a good reference book is not a simple process anymore when there are so many choices. It is complicated and tends to discourage the learner from going farther.

Therefore, providing free online education training that the materials are designed according to the needs for the educators is necessary. Besides being a training center, the website can be used as a reference center for teachers.

1.3 Objective of Research

The main objective of this research is to create an online interactive learning environment for the user that has an integrated tracking system. To accomplish this objective, three principal features had to be created. First, a clear user interface, second, a feedback system to provide immediate responses for users and third, clear and simple
instructions provided via a movable dialog box. Finally, the completed interactive learning system is intended to be used as a guide for future course content development.

In order to do so, Engineering Media Lab (EML) of the University of Oklahoma, funded by Hitachi Foundation, began developing a website for K-12 and votech teachers to learn multimedia tools. The following chapter presents the literature review on the technological status of the distance learning technologies used. It discusses about the advantages and disadvantages of each technology, and introduces the current website that offer multimedia courses.

EMET, which stands for Electronic Media Education for Teachers, is a three-year project that started in January 2000. The topics covered by this website are specially tailored to the K-12 and votech teachers’ needs. Anybody who is interested in learning the multimedia concepts like HTML, sound and graphics and their tools like Dreamweaver, Photoshop and Flash may access to the website for free.

In this website, common multimedia concepts and the tools used to deliver these concepts are discussed. The discussion is presented throughout three sections of this website. These sections are namely Concepts, Case Study and Tutorial. The Concepts section introduced theoretical multimedia ideas to the user. Case Study section presents examples created using the multimedia tools mentioned in the Tutorial section. Greater details for the overview of the website can be found in Chapter 3.

The Tutorial section of the EMET website is the main concern of this thesis, which is presented in detail in Chapter 4, 5 and 6. The capabilities of each multimedia tool are mimicked using Macromedia Director, which is then placed on the Internet in the Tutorial section. This allows users to experience how the actual program works. In the
Tutorial section, there are ten mimicked software. Each mimicked software presents one or more functions of a multimedia tool. Chapter 4 focuses on the contents that are selected to be presented to teachers in the Tutorial section. The layout of the section and advantages of the tutorials are also discussed in this chapter.

The development of the mimicked software is a tedious process. In order to simplify the process, a template is created. This template allows future developers to reuse the basic Macromedia Director file to mimic additional software functions. In this way, the developers do not have to create from scratch each time new software is needed. Chapter 5 focuses on the details of the Tutorial section design and discusses more on the underlying methodology.

In Chapter 6, emphasis is placed on the discussion of the technologies used to construct the Tutorial section, and the reasons behind using the selected technologies. Lastly, Chapter 7 concludes this thesis and offers some recommendations for future development.
CHAPTER 2: LITERATURE REVIEW

2.1 Online Distance Learning Technologies

Online distance learning technologies are divided into 4 different groups. They are audio-visual media, telecommunications based media, computer-based media, and advanced interactive technologies such as multimedia.

One of the examples of Audio-Visual media technologies is the Visual Teleconference System (VTS) that is widely used by the University of Illinois at Urbana Champaign for the past 25 years. VTS allows course material to be organized and presented in different ways. However, the downside of this system is the cost of the equipment. The system can cost more than $50,000 [12]. This popular method of distance learning only offers one-way presentation of the instructors’ training material (i.e. instructor to students). To address this disadvantage, Interactive Compressed Video (ICV) was introduced.

ICV is a telecommunications based media technology that provides two-way communication. There are numerous Universities like Boston University, Oklahoma State University, the University of Oklahoma and the University of Pennsylvania that are currently using this technology to conduct distance learning courses. This technology provides a synchronous learning environment to the students. The students can ask questions to the instructors during the class even though they are at different geographic locations. However, in order to provide a synchronous learning environment, the major drawback of ICV is that it required the presence of instructor and students during the
specific times when the courses are conducted. Instructors are not available outside of the class schedule and do not have virtual office hours.

Computer-Based training (CBT) is another distance learning technology used. It provides practice tutorials and support simulations. CBT information is generally distributed only through CD-ROMs. Hence, CBT information cannot be distributed as easily over the Internet. Another problem is that CD-ROM’s are more costly and difficult to update than other alternatives. Creating a new CD-ROM disk and even minor changes require re-distribution of the course content.

In contrast to ICV and CD-ROM delivery system’s, Web-Based training (WBT) is an innovative approach to distance learning. It is the next step from CBT technology. Instead of using CD-ROMs to distribute information like CBT, WBT uses the advantages of technology and methodology of the Internet and Intranets. The training system and course content is stored in servers and accessed through the network. The current focus of WBT development is on learning how to use the available architecture and authoring tools to organize content into well-crafted learning systems. Programs such as Blackboard and WebCT are examples of this development.

WBT is a media-rich training system that is fully capable of evaluation, adaptation and remediation. Best of all, since the information is distributed through the Internet or Intranet, the system performs independent of the computer platform.

As technology improves, the bandwidth speed and computer network technology increase, WBT has the potential to present live content if needed. Video and audio content can be broadcasted through World Wide Web with little or no time delay. Also, leading web browsers, like Internet Explorer and Netscape Communicator, can support 3-
D virtual reality (Figure 2.1), animation and synchronous participant interactions like chat room.

Due to the unique capabilities of WBT, it is an ideal vehicle to simultaneously deliver training to individuals throughout the world. It offers a flexible learning environment to meet different training needs and the learning schedule can be adjusted to individual. Furthermore, information in WBT can be updated easily and quickly via the network.

Despite these advances in the technology, WBT still has difficulties in providing good interactivity between the user and the learning system. Designers are still

Figure 2.1. Example of 3-D virtual reality over the Internet
struggling with the issues of user interface design and programming for high levels of interaction [13]. In order to achieve a better interactive environment, there are a number of important elements that need to be considered when developing a web based training program. These elements are mentioned in the following section.

2.2 Interactive Environment

One of the most important objectives for the training designer is to create an interactive learning environment over the Internet. Creating a system that has an ability to communicate with the users is not sufficient to achieve the ideal environment mentioned above. The system needs to convince the user to be part of the interaction. A good user interface plays an important role in this aspect.

In order to create a good user interface, the following five elements should be considered when designing a training course website. These elements are target audience, ease of learning, controllability, response time and modeling.

Target audience

When developing a course website, training designers should consider the nature of the expected users. Delivering the content and level of complexity which meets users’ needs and demands will capture users’ attention. Designers must be sensitive to user’s needs or there will be low satisfaction and users will become less likely to use the website. Sensitivity design also greatly affects the learning process of a user. For example, the requirements to design a website to teach word processing software, like
Microsoft Word, to a engineering student will be different from teaching a student from the college of business or education. This is because each student may need to employ different functions in the word processing software. For an engineering student, he/she is more interested in learning how to import graphs and equations in a program. However, a business student may need to know other functions. In EMET, K-12 and votech teachers are the projected users. The teaching materials and examples are designed to fit into their needs.

Ease of learning

The course structure design must be easy to follow. The user must be able to concentrate on the material they are learning rather then figuring out the mechanics of using the courseware. Difficult course navigation disrupts the learning process. Clear and simple instructions must always be provided to the users. Extra guidance, like indication arrows or circles, may be necessary to provide an interactive environment. This guidance helps users to understand the instructions more quickly. Hence, the users are able to stay focused on the training materials. In EMET, step-by-step instructions and guides are provided to help users to understand the instructions.

Usability is determined by how effective, efficient and satisfactorily a user can achieve a specific set of tasks in a particular environment. Usability is also known as “User friendliness”. When a user visits a website that has good usability, he or she will stay at the website for a longer period of time and also consider revisiting it. User friendless is playing a steadily more important role in software development. Many
leading companies have allocated 6% [14] of their research and development staff to work on usability engineering. This usability budget is growing every year.

In addition, the materials in the website should be designed in an interesting way. They should not only clarify terms and principles, the design should be interesting and will motivate the learners to continue the learning process.

Controllability

Generally, users should have control over the course presentation. If throughout a course, the user can only control the speed of the presentation, by clicking forwards and backwards, start and stop buttons, many users will lose their interest during the course. This is the same as teaching a child to ride a bicycle without letting him or her physically practice on it. The children will not know how to ride a bicycle until when they try riding it. Like wise, the user must have the opportunity to act on the instructions given by the system rather than just do the reading and listening. Therefore, creating an environment that allows the user to virtually walk through the material is important. In EMET, users are allowed to have hands-on experience on the software.

Response time

One important factor in using online learning systems is the response time. There are three important response time limits in designing a system as stated by Miller [15] about 30 years ago. These basic rules still apply today in interface design. The limit for the user to feel that system is reacting instantaneously is about 0.1 seconds. One second
is the limit for the user’s to think without interruption. The users will stay focused on a
dialogue for a limit of ten seconds.

Basically, the rules indicate that the response times should be as fast as possible. However, it should not be so fast that users are unable to keep up with the information. Following these rules will help to maintain users’ interests in the website or course site. Furthermore, it is also important to be certain that the users always need to be informed when the program needs more time to respond. Otherwise, the users might wonder what is happening and leave. The courses in EMET do tracking on the user input. Appropriate response is given to the user on both correct and incorrect input. These courses are delivered through shockwave, hence the response time is fast.

Modeling

Distance learning courses should not take the learner’s initial interest and continuing engagement for granted. Once the learner has started a course, whether he/she will continue depends on the motivation principles embedded in the course. Interactivity and engaging personalized graphics help to provide that motivation [16]. Users are attracted by a highly interactive, directly manipulated interface when engaging in a learning task [17].

In the traditional classroom, students achieve cognitive understanding mainly through access to linear texts and discussion. In order to achieve understanding in online learning technology, “Modeling is an important element of cognition” [18]. In general, modeling technologies fall into two categories: pre-defined simulation, and modeling
environment [19]. A modeling environment, the one that is more desirable but harder to obtain, allows unlimited flexibility. It lets the learner walk into the virtual world and understand the concepts easier and faster. EMET courses are built based on this concept. Users are allowed to use the mimicked software over the Internet and understand how the actual program works.

2.3 Online Distance Learning Instructional Course Website

Online distance learning instructional course websites are generally structured in one of two ways. The first method, commonly used in universities to create online courses, is to purchase a course management system. The second method is to develop the course website from the ground up. This requires more work and knowledge in multimedia technologies. However, it is easier and more possible to create an interactive learning environment. The following two sections of this chapter focus on the current leading Computer Management Systems and course websites used by the general public.

2.3.1 Course Management Software

Course Management Software (CMS) is widely used in higher education to provide online learning experience. Basically, CMS is a ready made, off-the-shelf package for instructors. The instructor places the training material into the CMS and an online course is ready to present these materials to the students. CMS is usually easy to learn, easy to use, flexible and easy to integrate with other software. The few leading
companies in providing this software are Blackboard and Universal Learning Technology.

BlackBoard offers to the customers three different level of control to it. Currently, this program is widely used by 3.5 million unique active users at more than 4,000 colleges, universities, school and other organizations in 50 states and more than 70 countries, generating more than 200 million page views per month [20]. Also, there are more than 600,000 registered users and more than 70,000 course websites [20].

BlackBoard has a good user interface and its administrative tools are easy to use (Figure 2.2). It is also, flexible and can be customizable to individual preferences. Furthermore, it is cost-effective for an institution to migrate to Blackboard system from its existing course content to the web.

![Figure 2.2. BlackBoard interface](image)

BlackBoard also provides a centralized information area for its users. Students who are taking more than one course, only need to login once to access all of the courses they are taking. This helps students to organize their course schedules easier. Also, they
have management tools like announcements, calendar, grades and address book. The program also links colleges and universities together through the Internet. Moreover, it also has a community area where students and instructors can interact, just like social chatting outside a traditional classroom.

BlackBoard is a good program to provide courses for general population. Instructors do not need a specific computer skills to create a course site with a good interface. The instructors are only required to put the course materials into place to complete the course site. However, when good interactivity is needed, like allowing the users to try an activity, this program has difficulties supporting scripting and third-party plug-ins such as shockwave.

WebCT is another widely used CMS product. It has 82 out of 94 desired features in a recent done by FutureU™ research report [21]. Currently, there are 6.2 million students account, 44,000 instructors in 1350 institutions over 55 countries. The price of this product ranges from $250 - $3000 per year per institution. The costs depend on the number of accounts that need to be created for the students.

WebCT has two ways of creating a course page. The instructor can either use the product built-in course builder software, or create the content outside WebCT and upload the content into the server. The content can be created in MS Word, Macromedia Authorware, MS FrontPage, Netscape Composer, MS Powerpoint and many other commonly used programs. It supports video and audio presentations. WebCT is a multi-platform software including Microsoft NT and Red Hat Linux.

WebCT also provides a tracking system on the students for the instructors. Through this system, instructors are able to understand the students’ needs and can help
them better by sending them e-mail or discuss with them in the chat room provided by WebCT. The interface of the product can be customized according to individual preferences. In this way, both students and instructors are able to design a better navigation for themselves.

However WebCT, has the same problem as Blackboard, it is unable to allow users to be very creative in their work. For examples, an engineering professor would have a problem if they need to create a quiz with complex equations. This is because CMS product mainly targeted at general uses for the instructors. Therefore, it is unable to support to complex requirements. An interactive environment is difficult to achieve.

In EMET, interactivity environment is the key issue. Users are allowed to interact with the computer. The system is designed to track the user input. Based on the input, the system generate responses for users to help them to complete the course.

2.3.2 Course Website

Besides CMS, another group of websites which are widely used to promote online learning are the course websites created generally by private organizations. The few websites that will be discussed in the section are SmartPlanet.com and Headlight.com

At SmartPlanet.com, the courses are conducted in two different ways, instructor-led course and self-study course. In an instructor-led course, it is further divided into classes and workshops. There are 2 types of membership - Free membership and Standard membership [22]. A member with free membership is allowed to attend certain courses without any charges and pay for the exact course price for the rest. For the
Standard member, they need to pay $15.95 per month, and then they are able to attend any class that has a course fee charge of below $19.95. Besides, providing a learning environment, the user can also join discussion groups and shop for books at that website.

![Creating Web Pages that are Accessible by People with Disabilities](image)

**Figure 2.3. Different course interface at SmartPlanet**

The courses at SmartPlanet are designed by the more than one companies. These results in inconsistencies in the way the materials are presented (Figure 2.3). The website
does provide interactive environment but it is still limited. The instruction box looks bulky and the position is fixed. Some users may prefer to shift the instruction box to another position. Some of the courses mimicked the capabilities of the program that is being taught. This allows users to have hands-on experiences with the program. However, the system is designed only to respond to correct input. If the user follows the instruction incorrectly, the system will not prompt user. This situation can be confusing to the user. The course in EMET tracks the user’s input. It gives necessary response to guide the user throughout the course.

Headlight.com offers more than 3000 online training classes [23]. The training courses offered are targeted from small to medium-sized businesses. The courses are created by other companies like Netg, Prosoft Training, learn2 and Element K. In this site, the user is given a Skills Assessment test at no cost before taking any class. Courses are recommended based on the test result. This helps to save time and money for the learner. Headlight.com also has an easy to navigate interface (Figure 2.4). The bar at the top of the website helps the users to readily locate the courses they have enrolled. There is no standard membership fee for this site. The charge depends on which courses the user is taking. There is a 10 minutes preview on each course that allow users to learn what is in the course before enroll. This allows the user to get a feel for the course before making any decisions.
The downside of the Headlight website is that the courses are produced by different companies (Figure 2.5). Each training program varies from one to another. Users need time to get use to the different interface. Another problem is that while some courses provide limited interactivity between user and program, many courses do not.

Also, there are a number of plug-ins required to download and installed. This is because different companies use different technologies to develop their course. Downloading plug-ins using a slow bandwidth can be time consuming. In EMET, Macromedia Director is employed to produce the interactivity courses content.
Shockwave, which is a common plug-ins, is the only plug-in required in EMET. Besides, the courses interface conducted in EMET has the similar looks among themselves.

In addition to online distance learning instructional course websites, multimedia courses are also offered in the traditional classroom. However, the traditional classroom courses have their own disadvantages. The following section of this thesis will discuss on this tradition teaching method.

### 2.4 Traditional Classroom

Traditional classroom courses are offered at universities throughout the United States. Besides universities, there are many regional institutions that also offer multimedia courses such as the Moore Norman Technology Center in Oklahoma [24].
The time duration of the courses offered by the technology center usually range from a week to a month. The cost of taking one course varies from $100 - $300.

One of the disadvantages of attending classes in a traditional classroom is that students have to travel to the particular institution. As such, time is wasted on transportation. Moreover, this kind of technology center is not available in all places. A student might have to travel out of their region to find such institutions. Another fact is that most students have a busy schedule. Even though most of these courses are offered after working hours to suit their schedule, not everybody can compromise that due to personal, health or other personal commitments. In addition, these courses are usually expensive. Plus, most website design courses do not go in-depth into the topics that they cover. Most of the time, the course only lasts for a short period of time, and the students are expected to absorb the wide topics covered.
CHAPTER 3: OVERVIEW OF EMET

3.1 Purpose of EMET

EMET stands for Electronic Media Education for Teachers and is designed to serve as a web-based course to teach K-12 and votech teachers basic multimedia concepts and common software tools through the Internet. This is a three-year project that is funded by the Hitachi Foundation, which started in January 2000.

One unique aspect of this project, is the collaboration between the College of Engineering and the College of Education at the University of Oklahoma. The College of Education provides the knowledge for the method to conduct the courses, while the College of Engineering supplies the technical support. Currently, the website is developed and maintained by Engineering Media Lab (EML) in the School of Aerospace and Mechanical Engineering, the College of Engineering.

EMET is a free website that is specifically designed for teachers. The topics covered in this website are selected and designed according to the K-12 and votech teachers’ needs. Since this is an online course website, EMET is providing an asynchronous learning environment that can cater to each individual teacher’s study habits, progress and schedule. Since teachers were targeted when designing this website, the teachers will feel better and find it easier to understand the contents in the website, and hence can be motivated to learn better.

The training materials are designed in such a manner that the user can have control of the learning process and always receive a fast feedback from the system. All
these are emphasized because the second purpose of creating this website is to demonstrate how to create an interactive online training environment.

EMET is designed to provide content to teachers through three sections in its website: Concepts, Tutorial and Case Study sections. These three sections are discussed in more details in the following section of this chapter.

3.2 Overview of Design

EMET is a project that will require three years of development and the main concentration of this thesis is focused on the course content development in phase one of the project. The coverage of the development is highlighted in Table 3.1. The development will lay as the milestone for the future development in phase two and three.

<table>
<thead>
<tr>
<th>Phase</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>• Develop a prototype online courseware.</td>
</tr>
<tr>
<td></td>
<td>• Investigate learning methods for online learning.</td>
</tr>
<tr>
<td></td>
<td>• Conduct design reviews.</td>
</tr>
<tr>
<td></td>
<td>• Develop basic course content.</td>
</tr>
<tr>
<td>2</td>
<td>• Develop advanced course content.</td>
</tr>
<tr>
<td></td>
<td>• Review and evaluate the usefulness of the website through a focus groups.</td>
</tr>
<tr>
<td></td>
<td>• Deliver courseware by Internet to select test sites.</td>
</tr>
<tr>
<td>3</td>
<td>• Deliver courseware.</td>
</tr>
<tr>
<td></td>
<td>• Conduct evaluation in elementary, middle and high school, vocational education and University of Oklahoma.</td>
</tr>
<tr>
<td></td>
<td>• Formal assessment, review and final modification on the web sites.</td>
</tr>
</tbody>
</table>

Table 3.1. Layout plan for EMET project

There are three sections involved in delivering the course content of this website. The three sections are Concept, Tutorial and Case Study. The user will visit the Concept
section to learn the basic theory of each multimedia concepts covered in EMET. Table 3.2 shows the multimedia concepts and its relevant tools conducted in the EMET website. After they understand the concepts, they can proceed to the Tutorial section to try out the multimedia tools. Finally, they can go to the Case Study section to see examples of the tool’s capabilities they were learning.

<table>
<thead>
<tr>
<th>CONCEPTS</th>
<th>TOOLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginner Level</td>
<td></td>
</tr>
<tr>
<td>HTML</td>
<td>Macromedia Dreamweaver</td>
</tr>
<tr>
<td>Drawing</td>
<td>Macromedia FreeHand</td>
</tr>
<tr>
<td>Graphics</td>
<td>Adobe Photoshop</td>
</tr>
<tr>
<td>Sound</td>
<td>Sound Forge / Sound Studio</td>
</tr>
<tr>
<td></td>
<td><strong>Intermediate Level</strong></td>
</tr>
<tr>
<td>Animation</td>
<td>Macromedia Director</td>
</tr>
<tr>
<td>Video</td>
<td>Adobe Premier</td>
</tr>
<tr>
<td>Vector 2D animation</td>
<td>Macromedia Flash</td>
</tr>
<tr>
<td></td>
<td><strong>Advance Level</strong></td>
</tr>
<tr>
<td>Data Visualization</td>
<td>Microsoft Excel</td>
</tr>
<tr>
<td>Simulation</td>
<td>Macromedia Director</td>
</tr>
<tr>
<td>Advance Animation</td>
<td>MetaCreations Carrara</td>
</tr>
<tr>
<td>Back-End Scripting</td>
<td>JavaScript</td>
</tr>
</tbody>
</table>

Table 3.2. Concepts and Tools covered in EMET

The next section of the chapter is presenting the Concept, Tutorial and Case Study section in greater details. The discussion will be on the purpose of each section and the software used to develop them. Also, other features provided in this website is mentioned.
3.2.1 Concept

In the Concept section, users are able to get basic multimedia knowledge. For example, if users are interested in learning HyperText Markup language (HTML), they can visit the Concept section and find information on HTML and recommendations for building a good website with the use of HTML (See Figure 3.1). Also, the current popular tools that are used to deliver HTML, and the advantages and disadvantages of each tool are mentioned in this section. Macromedia Dreamweaver is used to develop the Concept section. Once the users go through the Concept pages, and have a general understanding of the topic, they proceed to the Tutorial section.
3.2.2 Tutorial

In the Tutorial section, users try out the tools selected for demonstrating the concept taught in the Concept section. For example, in order to demonstrate HTML, Macromedia Dreamweaver was selected as the HTML tool to be modeled. This is
because of its capabilities and ease of use. Also, it is one of the most common tools used to develop HTML.

The Tutorial section is also the main focus of the thesis. In Chapter 4, the discussion will be on the advantages, layout and the purpose of the skills covered in the Tutorials. Following that, in Chapter 5, the design technologies of the Tutorials are presented.

The Tutorials allows the learners to have a hands-on experience with the selected software tools taught in the website. Once users go through the Tutorial section, they may proceed to the Case Study section.

3.2.3 Case Study

After reading the theory and trying the program, the users can view examples of what can be done using those tools. The Case Study section contains examples created using one or more of the tools taught in the EMET website. This allows the users to understand the capabilities of those tools and encourages users to set a higher expectation for themselves when developing their own websites for students. Figure 3.2 show the example of a Case Study.
Figure 3.2. Example of Case Study – History Class

The example topics were decided based on school subjects. These subjects include science, mathematics, history and foreign languages. The tools that are taught in each Tutorial as well as the level of the teachers’ expectation restrict the complexity of each example. The purposes of these case studies is to encourage teachers to build high quality websites. Creating an overly complicated example will only discourage teachers from further exploration.

Besides Concept, Tutorial and Case Study section, EMET also provides some features to enhance the user’s learning experience.
3.2.4 Other Features

The EMET website also includes features like Profile, Progress, Bookmark, Notes, Search and Help. Profile allows the user to change his/her personal information. Progress keeps track of personal progression information like the score of each skill completed. Users are able to learn about their own learning progress by visiting the Progress.

Bookmark allows users to bookmark any visited section inside the EMET website. This is to allow users to return to a particular page if they wanted to do so. The Notes feature allows users to take notes whenever they need to while visiting this website. Search is a common tool in almost every popular website. With this function, it will be easy for users to navigate the EMET website especially when EMET grows larger. Help, another common feature, is a particular good way for new EMET users to learn about EMET.
CHAPTER 4: TUTORIAL SECTION

According to Behaviorist theory, good teaching should consist of the following two points. The teachings should progress in small steps and the materials covered must be self-contained and wholly adequate since teachers may not be available at all times [25]. This is an age-old teaching theory and has been around since the year of 1958 and still works in today’s online teaching environment. The Tutorial section of EMET is built based upon this theory.

4.1 Purposes of the Tutorial Section

The Tutorial section is one of the most important features in the EMET system. In this section, an interactive learning environment is created for the user. The user simply follows the instructions given in this section, and uses the software features. This helps the user to better understand the materials and the capabilities of each tool that is being taught. The capability of each tool is mimicked using Macromedia Director shockwave files that are downloaded over the Internet. Through this method, the users can reduce their initial cost since they are not required to purchase any software to complete each Tutorial. They will have to purchase the software if they plan to use it after learning how to use it.

The Tutorial section is also created based on an asynchronous learning environment theory. There is no need for an instructor to conduct the courses. The users are able to visit EMET Tutorials 24 hours a day and 7 days a week. This design form
creates flexibility for the users. They are able to get in and get out of the site at anytime they prefer, and control the leaving at a rate they choose.

EMET is also free of charge to everyone in any part of the world. In addition to being a teaching center, it can also serve as a review center for those who already learned the materials through prior exposure.

4.2 General Layout of the Tutorial Section

Each Tutorial section contains two modules, a basic simulation and an advanced simulation. Inside a simulation, there are five different skills with each skill containing four different components. The four components are Interactivity, Dialog box, Quiz and Additional information box. Each skill contains about 5 – 10 minutes of simulated content. Figure 4.1 shows a breakdown of a Tutorial section.
A user enters the tutorial section by selecting either the basic or advanced simulation module. Once the user enters the desired simulation module, the welcome page appears (Figure 4.2a). The user can either click on the yellow START button to go to their first uncompleted skill, or he/she can go directly to any skill that is preferred by selecting the blue numbered button that represents the particular skill (Figure 4.2b). This is to allow users, who are revisiting the skill, to have a choice of revising the skill according to their preference.
Figure 4.2. Illustration on how to enter skill
When the user clicks on one of the simulations, the user’s login name, which was inputted when the user entered the website, will be sent to the web server through the ASP script (this is a server-side scripting technology) that generates the welcome page. The ASP script will access the database to check on the users’ learning schedule. A red check will then be displayed next to all the skills that the user has already completed.

Once the user starts the skill, instructions will appear in a blue floating dialog box (Figure 4.2c). The first instruction usually explains the purpose of that particular skill, and prompts the user to move on. Along the way, the dialog box will give explanations to the users on the steps they are taking. Through this learning method, the user will understand how the software functions, rather than follow the given instructions blindly. This helps users in long run as they will be able to figure out how the other similar application software functions.

The system also tracks the actions taken by the user (Figure 4.3). Whenever instruction is misunderstood or a wrong move is made, a pop-up message will appear to guide the users. This will help the user to realize and understand their mistake. Also, without the messages, the user might be unsure of the situation and confused what to do next. When the user reaches the end of each skill, they are given a choice to go to a brief quiz section or review the lesson.
Figure 4.3. Flowchart to illustrate how an skill functions
The purpose of the quiz at the end of each skill is to allow the user to test their newly acquired knowledge. There are three questions in each skill. The questions focus mainly on the materials that were taught in each skill. The user will get an immediate response after each question. If they answer correctly, the system will congratulate them and proceed to the next question (Figure 4.4). When they provide a wrong answer, the system generates an explanation for them. The scores for the questions are then sent to the database and recorded. One set of scores will be retained for the user under each skill. Older scores are overwritten by the user’s latest attempt. The purpose of the score is to help the user keep track of areas where they are having difficulties. Hence, they can revisit the skills anytime they want. When the user completes the three questions, they are allowed to move on to the next skill. If they have reached the last skill, the system will send them to the welcome page.
The discussion of the following section concentrates mainly on the contents of the skills. Each skill’s content is selected based upon the needs and wants of the teachers when they are developing web pages for their courses. The contents covered in this thesis focus mainly on the beginner level of EMET. Five programs are selected to demonstrate their individual capabilities in this section. They are Dreamweaver, Photoshop, Freehand, Sound Forge and Sound Studio.
4.2.1 Dreamweaver

Dreamweaver is used to build and publish web pages. The following features were selected to be taught to the users.

<table>
<thead>
<tr>
<th>Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic Simulation</strong></td>
</tr>
<tr>
<td>1 Insert image</td>
</tr>
<tr>
<td>2 Add text and change to difference fonts</td>
</tr>
<tr>
<td>3 Image and text alignment</td>
</tr>
<tr>
<td>4 Create links</td>
</tr>
<tr>
<td>5 Page properties management</td>
</tr>
<tr>
<td><strong>Advance Simulation</strong></td>
</tr>
<tr>
<td>1 Insert sound</td>
</tr>
<tr>
<td>2 Insert Flash shockwave and QuickTime movie</td>
</tr>
<tr>
<td>3 Insert table and modify number of row and column</td>
</tr>
<tr>
<td>4 Change border width and table width</td>
</tr>
<tr>
<td>5 Merge Cells and change cell color</td>
</tr>
</tbody>
</table>

Table 4.1. Content of the Dreamweaver Tutorial Section

The contents above cover the knowledge needed for teachers to develop a basic web page. The features under the basic simulation section allow teachers to design web pages for their classes. Classes such as history, requires images, text and links to other sites. With the knowledge acquired in advanced simulation, the teachers are able to better organize their materials using tables, introduce movie, sound and shockwave to enhance their web pages further.
4.2.2 Photoshop

Photoshop is used to edit photographic images. By mastering the materials in this tutorial, as shown in table 4.2, teachers will learn how to scan, alter, add text and change the format of an image. With this knowledge, teachers will be able to develop more exciting and interesting websites for their students. The teachers will also be able to merge images together to create a picture according to their lesson requirements. They will also be able to add text and arrow to a picture to highlight features of that picture.

<table>
<thead>
<tr>
<th>Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Simulation</td>
</tr>
<tr>
<td>1 Open and crop a picture</td>
</tr>
<tr>
<td>2 Enhancing picture quality by its properties</td>
</tr>
<tr>
<td>3 Adding text to the picture</td>
</tr>
<tr>
<td>4 Adding lines and stroking a selection</td>
</tr>
<tr>
<td>5 Resizing a picture and saving it</td>
</tr>
<tr>
<td>Advance Simulation</td>
</tr>
<tr>
<td>1 Import picture</td>
</tr>
<tr>
<td>2 Use magicwand tool</td>
</tr>
<tr>
<td>3 Use lasso tool</td>
</tr>
<tr>
<td>4 Introduce layers</td>
</tr>
<tr>
<td>5 Change color mode and learn filter option</td>
</tr>
</tbody>
</table>

Table 4.2. Content of the Photoshop Tutorial Section

4.2.3 Sound

Once a well-organized web page with good images is created, the next logical step is to introduce sound to the web page. Currently, there is no product in the market that supports both the Macintosh and Windows operating systems, and selling at an affordable price. Therefore, judging from Table 4.3, the materials covered in the basic simulation sections for both operating systems are similar. The software that is presented
in the basic simulation section is Sound Forge for the Windows platform and Sound Studio for the Macintosh platform.

<table>
<thead>
<tr>
<th>Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Open, set parameters, kHz, mono, 8/16 bit</td>
</tr>
<tr>
<td>2 Recording, sound level, save</td>
</tr>
<tr>
<td>3 Tools and effects, gain, noise reduction, fade</td>
</tr>
<tr>
<td>4 Digital editing, cut/copy/paste, add silence</td>
</tr>
<tr>
<td>5 Import Sound and convert sound file format</td>
</tr>
</tbody>
</table>

| Basic Simulation (Win) | 1 Open, set parameters, kHz, mono, 8/16 bit |
|                        | 2 Recording, sound level, save |
|                        | 3 Tools and effects, gain, noise reduction, fade |
|                        | 4 Digital editing, cut/copy/paste, add silence |
|                        | 5 Import Sound and convert sound file format |

| Basic Simulation (Mac) | 1 Open, set parameters, kHz, mono, 8/16 bit |
|                       | 2 Recording, sound level, save |
|                       | 3 Tools and effects, gain, noise reduction, fade |
|                       | 4 Digital editing, cut/copy/paste, add silence |
|                       | 5 Import Sound and convert sound file format |

Table 4.3. Content of the Sound Tutorial Section

Setting parameters, reducing noise and introducing effects are important features that are needed when trying to obtain a good sound quality. Over the Internet, the sound quality and file size are equally important. Teachers need to know how to produce small files with good quality sound.

4.2.4 FreeHand

FreeHand is a sophisticated program that produces vector-based graphics illustrations. In this tutorial, teachers learn how to draw simple objects like a sphere, square or triangle, and add colors to them. These drawings can be exported from FreeHand and incorporated into the web pages. The drawings are useful especially when presenting mathematics concepts, or technical materials used usually by vtech teachers.
### Skills

<table>
<thead>
<tr>
<th>Basic Simulation</th>
<th>1</th>
<th>Setting up for the draw board</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>“Shift” key, color and draw circle</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Resize and color gradient</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Draw straight line and alignment</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Texts</td>
</tr>
<tr>
<td>Advance Simulation</td>
<td>1</td>
<td>Drawing rectangular and lines with arrows</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Drawing multipoint lines</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Cutting, joining and rotation</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Select and move, group and ungroup objects</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Draw curve lines with control handle</td>
</tr>
</tbody>
</table>

Table 4.4. Content of the FreeHand Tutorial Section

### 4.3 Advantages of the Tutorial Section

By working in the interactive learning environment of the Tutorial section, users learn many of the basic functions of multimedia software. They understand the correct approach when using the software. During the learning process, instructions are given in a first person manner, rather than the third person. This helps to narrow the gap between the user and the computer. Also, the system alerts users whenever they do not follow the given instructions. The alerts enable users to learn faster and realize their mistakes earlier. Once the user has completed the instruction section of the skill, they can choose to review the lesson or move on to the quiz section.

The questions in the quiz section are designed according to the contents that are taught in the tutorial section. These questions help users to understand how much they have learned from each skill. The results of the quiz are stored in the database for the user’s future reference. Using these records, users are able to keep track of their own progress.
Since it is not necessary for them to purchase and install the software, the users can save money on the software and save time installing it. Also, this section is presented using a shockwave movie. The only plug-in required is the shockwave player, which is incorporated in newer browsers, is free and is easy to install.

Users are able to gain access into these materials according to their individual schedule and needs, since the materials are available 24 hours a day, 7 days a week over the Internet. The tutorial of each topic is divided into 10 skills. Each skill takes about 5-10 minutes to complete. With this design, it creates a flexible and convenient environment for the users. They are able to master the skills even when they have a tight schedule. They can leave the website at the end of each skill and go back in whenever they have the time to do so. The download time for each skill is also fast since the individual file size is small.
CHAPTER 5: DESIGN

In this chapter, the discussion focuses on the backbone of the Tutorial section. The discussion starts with the general design layout, followed by the design of the individual section within each skill.

Figure 5.1. Six Cast libraries

In a Director movie, the Cast of each skill is divided into six cast libraries. Cast is the place to contain images, lingo script and other materials that is used in a Director movie. Six cast libraries are created to contain the material used for an skill. They are Content-script, movingbox, Quiz, Content-others, Network and additional information (Figure 5.1). The libraries contain information for the four different components. As mentioned in Chapter 4, the four components are Interactivity, Dialog Box, Quiz and Additional information. The purpose of each library is presented in Table 5.1.
Cast Library | Purpose
--- | ---
Content-script | To contain script for Interactivity section
Content-others | To contain images, text and others for Interactivity section
Movingbox | To contain information that used in Dialog box
Quiz | To contain information using in Quiz section
Network | To contain external information
Additional information | To contain information that is used in additional information component

| Table 5.1. List of Cast library |

These six libraries are created to provide easy maintenance after the initial development. When there is a need to add extra information, the new developer who takes over the job will not have difficulties in doing so. The developer only has to go to the respective library to make the changes without worrying about corrupting the program. Also, when new skill needs to be developed, the developer can just simply erase the old contents and put in new ones.

5.1 Interactivity Component

When developing a new skill from an old skill template, the majority of the lingo scripts and images that need to be modified are from the Interactivity component. As shown earlier in Table 5.1, two cast libraries, Content-script and Content-others, are catered for this component. Content-script cast library contains mainly the lingo scripts for the skill that is needed for the Interactivity section and Content-others cast library contains the rest of the materials for this section such as images, vector shape and texts.
With this design, developers only need to delete the majority of the cast members in both libraries and create new lingo scripts and images that are customized according to the new skills.

5.2 Dialog Box Component

Dialog box component is designed to deliver instructions to the users while they are going through the skills. The dialog box was designed using Adobe Photoshop and then imported into Macromedia Flash. Using Flash, an animated dialog box is created. Macromedia Director imports the Flash movie and controls the opening and closing of the box using Lingo script. A Flash movie is used, instead of a series of images, because a Flash file size is small and can be easily controlled using Lingo.

The dialog box is made movable so that the users can shift the box around to suit their viewing preference. On the top bar of the box, there are 5 buttons. The first button from the left opens up the information box. Following it are the backward and forward buttons respectively. The last two numbers on the right are the buttons to open and close the instruction screen. Figure 5.2 shows the opened and closed position of the final version of the dialog box.
The dialog box is designed with future development in mind. More buttons can be added easily when new features are needed for the skill. The buttons on the top bar are small, but are not difficult to activate. The design is kept simple and easy, so as to allow easy acceptance from the users. The majority of the empty space is designated for the instructions that will be given. The dimensions of this box is restricted by the size of the skill.

The dialog box has undergone many versions before EMET team finally settled on this design. The old designs were abandoned, and the reasons behind the decision will be mentioned in the next section.

5.2.1 Usability of the Dialog Box

The first version of the dialog box was simple as shown in Figure 5.3. The only functions provided were the backward, forward and close buttons. This box was small and did not take up much space in any of the skills. However, there was little room for instructions and for adding buttons. Due to the limited spaces on the dialog box, version 2 was introduced (Figure 5.4).
For version 2 of the dialog box, users complained that it was difficult to read the instructions with a black background. The forward and backward buttons switched places from bottom to top, when the instruction panel is closed. This design was difficult to maintain. More work was needed when adding new buttons. The color combination also did not suit the users tastes. To eliminate those concerns, version 3 was introduced (Figure 5.5).

![Opened position](image1.png) ![Closed position](image2.png)

**Figure 5.4. Dialog Box - Version 2**

Version 3 of the dialog box received a better response, as compared to the previous versions. However, there were still some users who thought that the colors were too dull, and that this would affect their learning moods. Besides, the logo of EMET took up majority of the space on the top bar. The design of the top bar was also too complicated. There was shading and thus making the maintaining job more complicated. With all these responses, the final version of the dialog box was decided. The final version, which is shown in Figure 5.2 mainly simplified the top bar’s design and the color was also changed.
5.3 Quiz Component

At the end of each skill, users are requested to complete a quiz. The quiz component was created using the drawing program inside Macromedia Director. The design was kept simple since every skill will require different sets of quizzes. Ease of updated is important, and this requires a simple design. The texts and the background are different cast members, so changes in questions and answers can be made easily.
In order to simplify the process of putting up a question after it is formed, a property list is created. The property list contains the parameters for the behavior of a sprite. The list is shown in Figure 5.7. When the property list is drag into the answer’s sprite, the developer only has to change its question and answer number. Stating whether it is a correct or not by highlighting the box. This list is created using Lingo script in Macromedia Director.
5.3.1 Response Box

When a user attempts a question, this box appears to inform the user whether it was correctly answered. The position of the response box covers the “next” button in the question. The color used also contrasts with the question box. In addition, the question is covered with a gray shade when the response box appeared. All these are to shift the users’ attention from the question to the response box so that they can read the explanation before proceeding.
The response box appears according to the answer given by the user. Using the property list, the system knows which is the correct answer. A correct answer receives one point and an incorrect answer results in subtracting one point. When users submit their answers, the total score of that particular solution is calculated and sent to the response box section. If the total score tallies with the preset score, the response box appears with a congratulation message, otherwise an error explanation appears.

5.4 Additional Information Box Component

The Additional Information component is intended to provide extra information for the user (Figure 5.9). The box always appears on the top right hand corner of the
system. It is fixed in that position. This box is constructed using the drawing tools in Macromedia Director. This is because this section requires lots of flexibility in its size. When the skill requires more information, the size of this box must be able to grow accordingly to provide that information. On the other hand, when there is little information, the box can be reduced.

Figure 5.9. Additional Information Box
CHAPTER 6: TECHNOLOGY USED

The EMET Tutorial section contains many different skills and requires an enormous amount of interaction between the users and the computer. In order to achieve a high level of interaction, several technologies are selected. This chapter focuses on the technologies employed to develop the Tutorials and the site design considerations.

6.1 Macromedia Director

Under the tutorial section, extensive mimicking of the software being taught is needed. Macromedia Director was selected to perform this task since Director is easier to develop simple interactive simulations than Java. Java needs a high level of programming skills to produce a similarly interactive environment.

Director is also has a lower learning curve than Java. During the development of a task, Director provides a visual stage which allows the programmer to easily manage development. Inside Director, it also provides a “click and drag” functions. The developer can select imported images to the Stage or a Lingo script to a member on the Stage easily.

Besides the Stage, Director also has Cast and Score features. Cast operates like a container. It is a place to store the cast members that are used in movie. Figure 6.1 show the Stage, Cast and Score of the Macromedia Director. Score is a time-based chart that controls how and when the members to appear on the Stage. With these features in
Director, developers can develop quicker and easier in a structured programming environment [26].

![Macromedia Director Interface](image)

**Figure 6.1. Macromedia Director Interface**

Director can easily incorporate other media such as Flash, QuickTime movie, AVI movie, audio and images. This convenience is important for EMET development. In EMET, Flash movie and images are imported into Director. Director also has its own built-in programming language known as Lingo.
Lingo, which is created to enhance the capabilities of Director, increases interactivity within movies and controls images, including vector-based graphics [27]. The language is also useful in controlling the audio and video played in Director. In EMET, Lingo is used to enhance the interactivity of the course content. By using of Lingo, completed Director movie files can be highly compressed and exported as smaller-sized shockwave files. The shockwave files will then be able to be rapidly downloaded through the Internet and played in the browser’s Macromedia Shockwave player. EMET take advantages of this feature to deliver small file size course content.

A Shockwave player is usually embedded into most browsers. Even if the browser is not equipped with the player, it can be easily downloaded by clicking on the download link in the EMET site. Once the player is installed, it provides an automatic update function, which informs the user whenever a new player is needed. There are currently almost 150 million Shockwave player users in the world [28] and this number is still increasing.

The download time for a shockwave movie is fast and it supports data streaming technology. Streaming is a process whereby a movie will begin playing before the entire movie is downloaded [29]. The movie will start once a minimum amount of media is downloaded, and more will be added as the movie is playing. With streaming technology, the users enjoy a shorter downloading time.

On the other hand, Director Lingo is not an independent language, unlike C++ or Java. Lingo does not have as many functions as the independent languages. This is because the only group of people that are able to create new functions for Lingo are the programmers at Macromedia. In order to offset some of the disadvantages in Lingo,
many companies develop different Xtras which are plug-in modules that help to expand the capabilities of Director.

In the EMET project, information is needed to send between the shockwave movie and database. ASP (a server-based technology) and some other technology are used to provide support for the communication. The following three sections presents this technology information.

6.2 Internet Information Server

Microsoft Internet Information Server (MS IIS) is a file and application server for both the Internet and intranets. In EMET project, MS IIS was chosen because ASP (a server-based technology) is tightly integrated with it [30]. This makes the task of generating dynamic pages easy. Also, MS IIS is easy to manage and able to knit ASP and database closely. It also has a faster website response because it was designed to work closely with the NT Server platforms. Moreover, MS IIS enables web broadcast of EMET content and provides a level of security to the website.

6.3 Active Server Pages

Active Server Pages (ASP) is a server-based technology created by Microsoft. It was originally created only for use on a Microsoft platform but it has quickly become available for nearly all web servers on many operating systems. Currently, there are over 250,000 web developers using ASP.
ASP is used in EMET because of the low learning curve. This technology is simple to use and allow many scripting languages, from VBScript to Python, to be used. It is also well integrated with NT Server environment. The development of this technology is stable and rapid. Furthermore, ASP can easily communicate with a database.

In the Tutorial section, ASP works hand-in-hand with Structured Query Language (SQL) to present the information to the user when the user accesses the Tutorial. Also, each of the Director shockwave files is embedded into an ASP file. This architecture is used because ASP is able to provide Shockwave with any external parameter that Shockwave needs when sending information to the database.

In order to allow ASP to communicate with the database, SQL is needed. In the next section, the discussion is on the reason for using SQL and how it was used in the EMET project.

6.4 Structured Query Language

Structured Query Language (SQL) is the standard language used to communicate with a relational database [31]. It acts like an interpreter between a tourist in a foreign country where the foreign country is the database and the tourist is another language like PERL or VBScript. SQL can define data structures, manage database objects, manipulate data and manage database transactions and can also manage database security.
In the EMET Tutorials, at the end of each skill, there is a quiz for the user. The answers provided by the user and the scores of the quiz are sent from Director to an ASP file. Inside the ASP file, SQL statement, acting as a traffic police, receive and send the information to the database. Figure 6.2 gives a picture illustration of the SQL usage. This information is stored in the database and can be retrieved from the database when it is required.

6.5 Database Management System

A database-management system (DBMS) consists of a collection of interrelated data and a set of programs to access those data. Database systems are designed to manage large bodies of information [32]. Examples of these systems are MS Access, MS SQL, ORACLE and DB2. With DBMS, information is conveniently and efficiently to organize, searched, updated and stored. It also helps to control data redundancy and
inconsistencies. Since DBMS also provides password setup, it provides security to the stored information as well.

![Microsoft Access interface](image)

Figure 6.3. Microsoft Access interface

In this project, information such as user identity, password and skill scores are stored in MS Access. MS Access is inexpensive, easy to manage and also easy to upgrade to MS SQL when a more sophisticated DBMS is needed (Figure 6.3 shows the MS Access interface). This is because both MS Access and MS SQL are the products of Microsoft.
6.6 Macromedia Flash

After understanding how the information is sent to and where it is stored, the focus to this chapter will turn to the technology used to deliver each skill. In each skill, there is a movable dialog box that contains the instructions. This dialog box is created using Macromedia Flash.

Macromedia Flash is a vector-based program that is commonly used when creating beautiful, resizable and, compact navigation interfaces (Figure 6.4 shows the interface of Macromedia Flash). It is also used for long-form illustrations for the Web [33].

Flash is commonly used because the Shockwave file exported is small. It is also easy to learn. Flash files are played back using either the Macromedia Shockwave player or Java. In addition, it can be exported as a stand-alone projector. Using Flash, simple animations can be easily built.
The movable dialog box used in the Tutorials was created using Flash and imported into Macromedia Director for each skill. The movable dialog box is then controlled using script written in Lingo. This is because in Director, it is hard to achieve the image quality and file size that is generated when using Flash. On the other hand,
Flash is not as powerful as Director is in creating an interactive environment. Even after the ActionScript was introduced to Flash, the capabilities of Flash are limited in comparison with Director.

6.7 Macromedia Dreamweaver

The welcome page of the Tutorial section is generated using Macromedia Dreamweaver. There are several good HTML tools available in the market, such as Microsoft FrontPage and Adobe PageMill. However, Dreamweaver was used because it has a good site management utility that allows fast modification of web pages through use of templates. It also generates clean HTML code and support JavaScript, DHTML, CSS and frames development. Besides, Dreamweaver is also a “What You See is What You Get” (WYSIWYG) HTML editor [34]. This is an important feature to have when there is a need to create static web pages quickly. Developing static web pages is easier when things are visible to the developer. Figure 6.5 presents the interface of this program.
6.8 Adobe Photoshop

In EMET, Adobe Photoshop was used because this product is the world-standard in image-editing instrument for the Web or hard-copy print [35]. Photoshop accepts a wide variety of file formats and also has a user-friendly interface (Figure 6.6).
Figure 6.6. Adobe Photoshop interface

After each image was captured using SnagIt (a screen capture software), some minor details were required to be taken care of. Using the power of Photoshop, the images for a particular file can be altered easily. The image in Figure 6.7 was used in one of the project’s skills, so as to demonstrate the capabilities of Photoshop.
6.9 SnagIt

TechSmith developed SnagIt approximately 10 years ago [36]. Over the years, the engineers in TechSmith have made significant improvements on it. SnagIt has the capability to customize screen captures with a simple tap of a hotkey. Besides taking image captures, SnagIt can also take text and video captures. Figure 6.8 shows the interface of SnagIt.

![SnagIt interface](image)

Figure 6.8. SnagIt interface
Another way of doing a screen capture is through the “Print Screen” button, but this does not allow the user to have a choice of what is captured. The “Print Screen” button will just take a screen shot of the entire desktop. Another problem is to show the screen shot, or to save the image, a graphics authoring software program such as Photoshop must be used.

SnagIt, on the other hand, is able to control the area size of the image with higher precision. SnagIt has eleven options for the users to choose from for the screen captures, and five options for output methods. Individual output methods can be further customized. If the users wanted to save the capture as an image file, they can determine the image file’s extension (Figure 6.9). SnagIt is also a rather independent program, since it that does not require another graphics authoring software to save or view it.

![Output Properties](image)

**Figure 6.9. Output properties of SnagIt**
In this project, there are numerous images that need to be captured on screen. These images are later used in Macromedia Director to mimic the software capabilities. With SnagIt, the time spent in capturing and authoring images is greatly reduced.
CHAPTER 7: SUMMARY AND RECOMMENDATIONS

7.1 Summary

Teachers are always one of the important factors in determining the learning process of students. Students normally perform better when teachers can explain clearly and keep their interest with the class. Multimedia is a powerful tool that can assist teachers in attaining this goal. If a teacher creates a good website, teachers and students from all over the world will benefit. However, not many teachers have the ability to build a website, due to their insufficient knowledge in multimedia.

For teachers to acquire multimedia knowledge, one of the options is to attend the courses on the websites provided by universities and private organizations. However, the costs to attend these courses are expensive. The course contents are designed for the general public and they are not suitable for teachers. Plus, most of the course contents do not provide interactivity. As for traditional classes conducted by educational institutions, they usually have inflexible class schedule. The duration of the courses are long and learners need to travel to the particular institutions. This type of education institutions are also not available everywhere.

To teach teachers basic multimedia skills and concepts, the research project named EMET was created. Besides teachers, the website is also open to anyone who is interested in the training offered at this website at no cost. This website was designed based on an asynchronous learning environment, so as to provide a flexible learning schedule to users in any part of the world.
In order to provide a total learning experience for users, the EMET website is generally divided into three different sections. They are Concept, Tutorial and Case Study. The Concept section delivers basic information on multimedia knowledge, Tutorial section provides hands-on experience on the software and Case Study showcases the capabilities of each software. Once the users go through these sections, they will be able to gain knowledge in the theoretical, practical and visual aspects of learning.

The main focus of this thesis is on the Tutorial section of the EMET website. It was developed to serve as an example on how an online interactive learning environment can be attained. Five elements were considered when developing the Tutorial section, including the targeted audience, ease of learning, controllability, response time and modeling. All five elements will be elaborated in the next few paragraphs.

In this project, K-12 and votech educators are the targeted audience because they do not have technical support from the school. Current course websites and traditional teaching methods are not suitable for them. In EMET, the course content and its level of complexity were designed to meet their needs.

To increase the ease of learning, clear and simple step-by-step instructions are provided to the user to help them to complete each skill in the Tutorial section. Extra guidance are also given to help the user understand the instructions faster.

In EMET website, the response time is fast. This is to ensure that the user will stay focused. The file size of each skill in the Tutorial section is small and fast to download. It was developed using Macromedia Director and then, highly compressed and exported as a smaller-sized shockwave file. Hence, the shockwave movie that
supports data streaming technology allows the user to download the movie in a shorter time. In the shockwave movie, the response time is also fast.

To allow them to have good controllability and modeling learning environment, the course contents were mimicked using technologies such as Macromedia Director and ASP scripting languages. This is to provide realistic software environment to users and allow them to have hands-on experience on the software.

This project also designed a tracking system. Pop-up messages will appear to inform the user about their mistakes and guide them to the correct path. This helps the users to understand the course content faster. Furthermore, at the end of each skill, a quiz will be provided for the user. This is to help the user to test on the newly acquired knowledge.

In this research, future development is also taken into account. Each skill is divided into four components. They are Interactivity, Dialog box, Quiz and Additional information box component. Each component takes care of each part of the skill. The Interactivity component allows the user to communicate with the system. Dialog Box provides instructions and guides to the user, such that they can master the skills with greater ease. The Quiz component contains questions at the end of each skill to test the user’s newly acquired knowledge. The Additional information box provides extra information for the user on each skill that is taught. The skills were divided into four components, so that future developers can reuse the templates to develop new skills with ease.
7.2 Recommendations for Future Development

EMET is a three-year project and the EMET team is about to complete the beginner level of the tutorial section. They will be moving on to the intermediate and advanced levels in the coming year. A few recommendations are proposed in this section.

A sound option should be introduced to the instruction panel of the dialog box. Users would then have a choice of either listening to the instructions or to read them. This would be a nice feature to have; especially for people who favor auditory learning. The audio narration should be given an option of being turned on or off.

Expanding the function of the additional information box is also another recommendation. Currently, the purpose of the additional information box is to explain the layout of the dialog box. With some effort, the additional information box can be transformed into a reference book for the tools that are taught in EMET. Additional information is always useful to the user.

At this moment, there are only ten skills to a tutorial topic. Although, these skills already cover the majority of the basic features in a tool, there are some that would benefit from the increment of the amount of skills, to cover a wider scope of learning. Depending only on the EMET team to develop the skill will no doubt ensure the control of the skill’s quality. However, this process will be long. Therefore, encouraging users to submit some skills might assist the process.

Furthermore, introducing a tracking system inside the skill will allow the developer to understand how long it takes each user to complete an skill. This
information is useful in guiding the developer in future development and identifying problematic skills.
REFERENCES


26 Rosenzweig, Gary, 1999, “Special Edition – Using Macromedia Director 8.” Que, Indianapolis, IN

27 Macromedia, 2000, "Macromedia Director 8 Shockwave Studio: Lingo Dictionary.", Macromedia Inc.


30 Fedorov, Alex, Francis, Brian, Harrison, Richard, Homer, Alex, Murphy, Shawn, Sussman, David and Wood, Stephen, 1998, “Professional – Active Server Pages 2.0.” Wrox Press Ltd., Birmingham, UK.


APPENDIX A

SAMPLE LINGO SCRIPT
### Content Script Library

<table>
<thead>
<tr>
<th>Event</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>On Startmovie …</td>
<td>To initialize the movie</td>
</tr>
<tr>
<td>On contrain …</td>
<td>This is a subroutine. The purpose is the “glue” the movable box together</td>
</tr>
<tr>
<td>On Exit Frame …</td>
<td>This is to create a stop for the cursor</td>
</tr>
</tbody>
</table>

### Movingbox Cast Library

<table>
<thead>
<tr>
<th>Event</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) On mouseUp me</td>
<td>This is the place to control the backward button in the dialog box.</td>
</tr>
<tr>
<td>(2)</td>
<td>This is the place to control the forward button in the dialog box.</td>
</tr>
</tbody>
</table>

### Quiz Cast Library

<table>
<thead>
<tr>
<th>Event</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>on getPropertyDescriptionList me</td>
<td>This script is to create the answer button property</td>
</tr>
<tr>
<td>(3) On mouseUp me</td>
<td>This script control the answer’s explanation</td>
</tr>
<tr>
<td>(4) on mouseUp</td>
<td>This script control which objective to go to after the user complete the current objective</td>
</tr>
</tbody>
</table>

### Network Cast Library

<table>
<thead>
<tr>
<th>Event</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>On Submittodatabase</td>
<td>This script transfer information to the destination which is outside the movie</td>
</tr>
</tbody>
</table>

### Additional Information Cast Library

<table>
<thead>
<tr>
<th>Event</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>On mouseup</td>
<td>If the users click on the “plus” sign on the dialog box, this script will send the additional information to the movie stage.</td>
</tr>
</tbody>
</table>
On Startmovie
-- Variable for bigbutton --
Global opentop, closetop, rightarrow, leftarrow
global bigbutton
-- For Text --
global text1, counter
-- For Question Section --
global AnswerList, Answerlist3, Answerlist1, AnswerList2
global Gscore, Gpoint
global GTscore, GTscore1, GTscore2, GTscore3
-- For Initialize --
Global locator, toolbox
sprite(2).cursor = [member "magicwandcursor", member "magicwandcursormask"]
--- bigbutton ---
puppetsprite closetop, true
puppetsprite opentop, true
sprite(closetop).visible = 1
sprite(opentop).visible = 0
sprite(rightarrow).visible = 1
sprite(leftarrow).visible = 1
member("bigbutton").regPoint = point(0,0)
-- text --
text1 = 31
sprite(text1).visible = true
counter = 1
-- Question Section --
repeat with j = 38 to 41
  sprite(j).member.hilite = false
end repeat
GTscore = 0
GTscore1 = 0
GTscore2 = 0
GTscore3 = 0
Gpoint = 0
Gscore = 0
AnswerList = []
Answerlist1 = []
answerlist2 = []
Answerlist3 = []
end Startmovie
on Constrain
  Global opentop, closetop, rightarrow, leftrightarrow
global bigbutton, constraintBox
global text1, add_info, counter

  -- main box --
sprite(bigbutton).constraint = sprite(constraintBox)
sprite(opentop).locH = sprite(bigbutton).locH + 214
sprite(opentop).locV = sprite(bigbutton).locV + 6
sprite(closetop).locH = sprite(bigbutton).locH + 200
sprite(closetop).locV = sprite(bigbutton).locV + 6
sprite(rightarrow).locH = sprite(bigbutton).locH + 123
sprite(rightarrow).locV = sprite(bigbutton).locV + 5
sprite(leftarrow).locH = sprite(bigbutton).locH + 97
sprite(leftarrow).locV = sprite(bigbutton).locV + 5
sprite(add_info).locH = sprite(bigbutton).locH + 28
sprite(add_info).locV = sprite(bigbutton).locV + 7

  -- Text --
sprite(text1).locH = sprite(bigbutton).locH + 14
sprite(text1).locV = sprite(bigbutton).locV + 26
end

On ExitFrame
  constrain
  if counter = 1 then
    where = counter
    counter = where
    PageNo = "Page" & where
    sprite(31).memberNum = member(PageNo)
  end if
  go to the frame
end

--------------------------- WARNING ------------------------
-- This General Exit Frame script is only suitable to use --
-- at frame position number which is increment of 5.  --
-- Example: frame 5, frame 10, frame 35.  If you wanted  --
-- to use it somewhere else, make sure to you change the  --
-- calculate and increase the floating point               --
------------------------------------------------------------

Global counter

On ExitFrame
  constrain
  whichframe = (the frame) / 5 - 1
if counter <= whichframe then
  where = counter + 1
  counter = where
  PageNo = "Page"&where
  sprite(31).memberNum = member(PageNo)
end if
  go to the frame
end

property seltwnrect, twnrect, mouselocation

on mousewithin me
  seltwnrect = rect(point(3,3), point(173,20))
  twnrect = rect(point(3,20), point(173,36))
  mouselocation = the mouseloc - sprite(4).loc
  if inside (mouselocation, seltwnrect) and the frame = 20 then
    sprite(5).loc = sprite(4).loc +point(3,3)
  else
    sprite(5).loc = sprite(4).loc +point(-500,-500)
  end if
  if inside(mouselocation, twnrect) = true and the frame = 40 then
    sprite(6).loc = sprite(4).loc +point(3,20)
  else
    sprite(6).loc = sprite(4).loc +point(-500,-500)
  end if
end

on mouseup
  if inside (mouselocation, seltwnrect) = true and the frame = 20 then
    sprite(2).loc = point(-500,-500)
    sprite(3).loc = point(-500,-500)
    sprite(4).loc = point(-500,-500)
    sprite(5).loc = point(-500,-500)
    sprite(6).loc = point(-500,-500)
    sprite(7).loc = point(50,100)
    go to frame 25
  else if inside(mouselocation, twnrect) = true and the frame = 40 then
    sprite(2).loc = point(-500,-500)
    sprite(3).loc = point(-500,-500)
    sprite(4).loc = point(-500,-500)
    sprite(5).loc = point(-500,-500)
    sprite(6).loc = point(-500,-500)
    sprite(7).loc = point(10,20)
    go to frame 45
  end if
on mouseleave me
    sprite(4).loc = point(-500,-500)
sprite(5).loc = point(-500,-500)
sprite(6).loc = point(-500,-500)
sprite(18).loc = point(-500,-500)
end

property selectrect, mousepos

on mousewithin me
    SSleft = sprite(me.spritenum).left
    SStop = sprite(me.spritenum).top
    selectrect = rect(point(SSleft+242, SStop+94), point(SSleft+296, SStop+118))
    mousepos = the mouseloc
end

on mouseup
    if inside(mousepos, selectrect) = true then
        sprite(7).loc = point(-500,-500)
go to frame 30
    end if
end

property mousepos, Prerect, Scanrect, Xrect

on mousewithin me
    mousepos = the mouseloc
    Prerect = rect(point(305,415), point(386,443))
    Scanrect = rect(point(388,418), point(470,443))
    Xrect = rect(point(480,20), point(497,35))
end

on mouseup
    if inside(mousepos, Prerect) = true and the frame = 45 then
        sprite(8).loc = point(284,85)
go to frame 50
    end if
    if inside(mousepos, Scanrect) = true and the frame = 50 then
        go to frame 55
    end if
    if inside(mousepos, Xrect) = true and the frame = 55 then
        go to frame 60
    end if
end
Property mouselocation, filerect, editrect, selectrect

on mousewithin me
    mouselocation = the mouseloc
    filerect = rect(point(5,24), point(34,42))
end

on mouseup me
    if inside(mouselocation, filerect) then
        if the frame = 10 or the frame = 30 then
            sprite(2).loc = point(5,24)
            go to the frame + 5
        end if
    end if
    if the frame = 55 and inside(mouselocation, filerect) then
        sprite(9).loc = point(5,23)
        go to frame 60
    end if
end

Global mouselocation, importrect

Property nextsp, nextsp2

on mousewithin me
    mouselocation = the mouseloc
    fileleft = sprite(me.spritenum).left
    filetop = sprite(me.spritenum).top
    importrect = rect(point(fileleft+3,filetop+218), point(fileleft+188,filetop+235))
    nextsp = me.spritenum + 1
    nextsp2 = me.spritenum + 2
    if the frame = 15 or the frame = 20 then
        if inside (mouselocation, importrect) then
            sprite(nextsp).locH = sprite(me.spritenum).locH + 3
            sprite(nextsp).locV = sprite(me.spritenum).locV + 218
            sprite(nextsp2).loc = sprite(me.spritenum).loc + point(187,216)
            sprite(18).loc = point(280,250)
            go to frame 20
        else
            sprite(nextsp).locH = sprite(me.spritenum).locH - 500
            sprite(nextsp).locV = sprite(me.spritenum).locV - 500
            sprite(nextsp2).loc = sprite(me.spritenum).loc + point(-500,-500)
            sprite(18).loc = point(-500,-500)
        end if
end if

if the frame = 35 or the frame = 40 then
if inside (mouselocation, importrect) then
    sprite(nextsp).locH = sprite(me.spritenum).locH + 3
    sprite(nextsp).locV = sprite(me.spritenum).locV + 218
    sprite(nextsp2).loc = sprite(me.spritenum).loc + point(187,216)
    sprite(18).loc = point(280,267)
    go to frame 40
else
    sprite(nextsp).locH = sprite(me.spritenum).locH - 500
    sprite(nextsp).locV = sprite(me.spritenum).locV - 500
    sprite(nextsp2).loc = sprite(me.spritenum).loc + point(-500,-500)
    sprite(18).loc = point(-500,-500)
end if
end if
end

Movingbox Cast

global counter, tablesprite, locator

(1)
on mouseUp me
    where = counter - 1
    counter = where
    if where = 0 then
        where = 1
        counter = 1
    else if where = 1 then
        go to frame 5
    else if where = 2 then
        sprite(2).loc = point(-500,-500)
        go to frame 10
    else if where = 3 then
        sprite(3).loc = point(-500,-500)
        sprite(4).locH = point(-500,-500)
        go to frame 15
    else if where = 4 then
        sprite(2).loc = point(5,24)
        sprite(7).loc = point(-500,-500)
        go to frame 20
    end if
    PageNo = "Page"&where
sprite(31).memberNum = member(PageNo)
end

(2)
on mouseUp
global counter
where = counter + 1
counter = where
if where = 2 then
   go to frame 10
end if
if where = 3 then -- on step 1
   alert "Click on File"
   where = 2
   counter = 2
end if
if where = 4 then -- on step 2
   alert "Select Import"
   where = 3
   counter = 3
end if
if where = 5 then -- on step 3
   alert "Follow the instruction"
   where = 4
   counter = 4
end if
if where = 6 then -- on step 4
   alert "Click on Select button"
   where = 5
   counter = 5
end if
end

QUIZ CAST
Property pwhichQns, pwhichAns, pwhichisCorrect
Global selectedQns, AnswerList, QuestionList
Global currentsprite, anssprite1
on getPropertyDescriptionList me
   List= []
   List.addProp ( #pwhichQns, 
      [#comment: "Question", #format: #string, 
         #range: ["1", "2", "3"],
         #default:"1"])
   List.addProp ( #pwhichAns,
List.addProp (#pwhichisCorrect,
[#comment: "Correct Answer?", #format: #boolean,
  #default: False])
return List
end

Global Correct, anssprite1, GScore, Gpoint, GTscore, QuestionList

(3) On mouseUp me
Submittodatabase
  if QuestionList = 1 or QuestionList = 2 then
    if Gscore = 1 then
      sprite(47).member = member("Explain1")
    else if the frame = 65 then
      sprite(47).member = member("Explain2")
    else if the frame = 70 then
      sprite(47).member = member("Explain3")
    end if
  end if
else if QuestionList = 3 then
  if Gscore = 1 then
    sprite(47).member = member("Explain1")
  else if the frame = 75 then
    sprite(47).member = member("Explain4")
  end if
end if
sprite(48).loc = point(442,434)
end

(4) on mouseUp
repeat with i = 43 to 48
  sprite(i).loc = point(800,800)
end repeat
if the frame < 75 then
  go to the frame + 5
else
  gotoNetPage "Objective2_t2.asp", "content"
end if
NETWORK CAST

```plaintext
global AnswerList, QuestionList
Global currentsprite, Correct
Global Gpoint, GScore, GTScore
Global Completed

on Submittodatabase
    if GTScore <= 0 then
        GTscore = 0
    end if
    dbloc = externalParamValue(1)
    databaselocation = string(dbloc)
    if QuestionList = 1 then
        answerlist1 = answerlist.duplicate()
        GTScore1 = GTscore
        infolist = ["moduleID": "graphics", "lessontype": "tutorial", "LessonID": "2" \ 
            , "ObjID": "1", "QnsAns": QuestionList, "Ans": answerlist1, "Score": GTScore1]
    else if QuestionList = 2 then
        answerlist2 = answerlist.duplicate()
        GTScore2 = GTscore
        infolist = ["moduleID": "graphics", "lessontype": "tutorial", "LessonID": "2" \ 
            , "ObjID": "1", "QnsAns": QuestionList, "Ans": answerlist2, "Score": GTScore2]
    end if
    answerlist.deleteall()
    GTScore = 0
    PostNetText(databaselocation, infolist)
end

ADDITIONAL INFORMATION CAST

on mouseUp
    sprite(51).loc = point(685,46)
    sprite(52).loc = point(763,61)
    sprite(53).loc = point(793,51)
    sprite(54).loc = point(808,56)
    sprite(55).loc = point(764,165)
    sprite(57).loc = point(800,102)
    sprite(58).loc = point(878,113)
    sprite(59).loc = point(845,98)
    sprite(60).loc = point(898,98)
    sprite(61).loc = point(830,168)
end
```
APPENDIX B

SAMPLE ASP SCRIPT – SHOCKTODB.ASP
Option Explicit
response.buffer = true

Dim QnsNo, Ans, Score
DIM Connect, Survey, SQL
Dim moduleID, lessontype, lessonID, ObjID, userID, completed

userID = request.cookies("username")
moduleID = Request.form("moduleID")
lessontype = Request.form("lessontype")
lessonID = Request.form("LessonID")
ObjID = Request.form("ObjID")
QnsNo = Request.form("QnsNo")
Ans = Request.form("Ans")
Score = Request.form("Score")

If userID = "" Then
   Response.Redirect("../error/error_cookie.htm")
Else

    ' Writing to a database: EMET.mdb in Emet_DB directory
    ' thru DSN: emetdatabasetest
    Dim ObjRS, SQL2
    Set Connect = Server.CreateObject("ADODB.Connection")
    Connect.Open "DSN=emetdb;"
    SQL2 = "SELECT * FROM Objectives where userID = ":&userID&":" and moduleID = ":&moduleID&":" and lessontype = ":&lessontype&":" and lessonID = ":&lessonID&":" and ObjID = ":&ObjID&":" and QnsNo = ":&QnsNo&":"
    on Error resume next
Set ObjRS = Connect.execute(SQL2)

If ObjRs.BOF = True then

    SQL = "Insert into Objectives(userID, moduleID, lessontype, lessonID, ObjID, QuestionID, Answer, score, completed )" _
    & "Values ('"&userID&"','"&moduleID&"', '"&lessontype&"', "&lessonID&","&ObjID&", ",&QnsNo&" ,"&Ans&", '"&Score&"', '1 ');"

Else

    SQL = "update Objectives set Answer = '"&Ans&"', Score = '"&Score&" where userID= '"&userID&" and moduleID='"&moduleID&" " _
    & " and lessontype='"&lessontype&"' and lessonID='"&lessonID&"' and ObjID='"&ObjID&"' and questionID="&QnsNo&";"

end if

Set Survey = Connect.Execute(SQL)

ObjRS.Close
Connect.close

Set ObjRS = Nothing
Set connect = Nothing
Set Survey = Nothing

end if

%>