

A MODEL OF AUTHORIZING SYSTEM FOR E-LEARNING COURSES

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Abstract

An Authoring system is a software with pre-programmed elements which allows both programmers and non-programmers to easily create interactive multimedia software courses. An author simply makes use of the templates of an authoring system by following online instructions to create and structure his subject matter to suit his choice. On the other hand, students use the graphical user interface to select and study any subject of interest. The focus of this research work was to model a robust authoring system that will help both computer and non-computer experts to prepare courseware in any subject of interest and as well as help him teach the authored courses to his students online. The entire package comes in form of a software template, which can be customized for individual users. This work is timely because it will totally eliminate the burden on programmers to write a different code for every computer-aided learning course. It will also give room to non-computer experts to author their own courses with ease. The software is user-friendly and interactive. Test questions are generated by random selection from pool of questions relevant to the subject matter and are administered at strategic points. The system design approach used in this research was the ADDIE model which employs five stages of Analysis, Design, Development, Implementation, and Evaluation. Visual BASIC programming language, Microsoft Access and Audio software were used for the implementation. The major contribution of this work is that it eases courseware preparation and delivery by exploiting high technology effectively. This software template is also of immense benefits to students of different disciplines as it will help them to learn their respective subjects with ease.

Keywords: Courseware, e-learning, Authoring Software, Learning, educational

1.0 INTRODUCTION

Technological advancement has made our present day society to become highly interactive and has also brought a new dawn to information transfer; a system that is gradually taking over the traditional method of doing things in all aspects of human endeavour. This advancement in technology has clearly turned our present day society to a

knowledge driven society. The driving force of the knowledge society is information and increased human productivity. To prepare for this society, knowledge workers need to have more general knowledge and to learn with less support [1]. In view of this great need, educators at all levels is beginning to think of supportive ways to traditional face-to-face

classroom method of teaching and learning in order to address their students' many different learning styles, broad range of abilities, diverse socioeconomic and cultural backgrounds. Computer-mediated learning popularly known as e-learning is now being used to help learners (both full time and part-time student) to cope with the demands of our knowledge age. It is worthy of note that e-learning can be as effective as traditional face-to-face learning [13]. From our experience so far, it is almost obvious that delivery costs of e-learning (including cost of web servers and technical support) are considerably lower than those of classroom facilities, instructor time, travel and job time lost to attend classroom sessions. Moreover, e-learning reaches a wide target audience by engaging learners who have difficulty attending conventional classroom training because they are geographically dispersed, busy with work or family, located in conflict and post conflict areas or those that faces difficulties with real time communication (very shy once) and those limited from participating in classroom session due to cultural or religious belief [3]. Furthermore, e-learning could naturally be blended with the traditional face-to-face classroom learning structure to give learners more opportunities to have an in-depth understanding of their subject of study. This is made possible since e-learning offer students the opportunities to learn at their own pace and convenience and also gives them room to study a particular subject matter more than once. E-learning offers effective instructional methods such as practicing with associated feedbacks combining collaborative activities with self-paced study personalizing paths based on learners need.

1.1 The Two General Approaches to E-Learning

According to Ghirardini [6], there are two general approaches to e-learning namely Self-paced e-learning and instructor-led e-learning.

(i) **Self-paced e-learning:** Self-paced e-learning offers learners courseware which can be complemented by supplemental resources and assessment [5]. The courseware is usually housed on a web server, and learners can access it from online learning platform or on cd-rom. Self-paced e-learning therefore gives learners freedom to learn at their own pace and to define personal learning paths based on their needs and interests. When self-paced e-learning is offered through an Internet connection, there is the potential to track learner's action in a central database.

(ii) **Instructor-led and facilitated e-learning:** Instructor-led e-learning is a model of e-learning where a linear curriculum is developed that integrates content elements and activities into a chronological courses or syllabus [11]. The course is scheduled and led by an instructor and or facilitator through an online learning platform. Learners, facilitators and instructor can use communication tools such as e-mail, discussion forums, chats polls, whiteboards, application sharing, audio and video conferencing to communicate and work together. At the end, a final step typically includes an exercise or assessment to measure learning. It is also worthy of note here that most e-learning courses combine the two approaches.

1.2 Why E-Learning?

There are enormous benefits in computer-mediated learning. E-learning reaches a wide target audience by engaging learners who have difficulty attending conventional classroom training because they are geographically dispersed, busy with work or family, located in conflict and post conflict areas. Some specific advantages of e-learning includes among others the following:

(i) The students talks at least as much as or more than the teacher (Wall, 2005)

(ii) The student participates in determining the subject matter; the studying is based on various sources of information, including web data banks etc [14]

(iii) The students' motivation is high due to the involvement in matters that are closer to them and to the use of technology [2] The learning allows anyone, anywhere, anytime to opportunity to participate pressure from limited time.

(iv) It makes lifelong learning a practical reality [10].

(v) It focuses more on the strengths and needs of individual learners.

1.3 E-Learning Content

E-learning courses are usually made up of the following major components:

- **Simple learning resources:** Simple learning resources are non-interactive resources such as documents, PowerPoint presentations, videos or audio files [6]. These materials are non-interactive in the sense that learners can only read and watch content without performing any other action. These resources are developed to match defined learning objectives and designed in a structured way.

- **Interactive e-lessons:** This is a linear sequence of screens which can include text, graphics, animations, audio, video and interactivity in the form of questions and feedback [6]. E-lessons sometimes include recommended reading and links to online resources, as well as additional information on specific topics.

- **Electronic simulations:** Simulation means creating a learning environment that emulates the real world, allowing the learner to learn by doing. Simulation immerses the learner in a real-world situation and responds in a dynamic way to his/her behavior [16].

- **Lesson aids:** Lesson aids provide just-in-time knowledge. They can take several

forms and be delivered on different platform (computer, mobile phone and printed document). They usually provide immediate answers to specific questions, thus helping learners to accomplish learning objectives.

1.4 The Objective of The Study

The specific objectives of this research include the following:

(1) To create a platform that will enable subject experts to develop courseware for their students in different subject matters.

(2) To try the possibility of eliminating the burden of writing new codes for every computer-aided learning course.

(3) To build software that will enable students/learners who are in a self-study programme to study online and be examined online.

(4) To build authoring software for computer-aided learning that will enable relatively unsophisticated computer programmers/users to create appropriate lessons.

2.0 Authoring Platform for Developing E-Learning Courses

In order to generate courseware by both computer experts and non-computer experts, one needs a platform to enable him do that. There should be a template-based tool or authoring software which will totally eliminate the burden of writing new programming code whenever a courseware is to be generated. These authoring Systems allow even non-programmers to easily create courseware with programming features. The programming features are in-built and hidden behind buttons and other tools, so the author does not need to know how to write program. This model provides such platform for authors to prepare their courses. However, we should take note of the fact that such authoring systems does not help plan your course or develop your learning goals with intellectual creativity, what such authoring tool does is to

give you the ability to be creative with the structuring and delivery of your course. In view of this every author must first plan his/her courses following effective and meaningful learning principles before using the authoring tool to structure and deliver his courses. Let us therefore first look at what meaningful learning is all about.

2.1 Meaningful Learning

In order for one to be able to develop a good e-learning courseware that can offer a pedagogical improvement on traditional teaching method, he must first have a clear understanding of what “a meaningful learning experience” is. According to Johansson, [8], meaningful learning occurs when learners actively interpret their experience using internal, cognitive operations. Meaningful learning has the following characteristics:

(i) Meaningful Learning is Active (Manipulative and observant)

When learning about things in natural contexts, humans interact with their environment and manipulate the objects in that environment, observing the effects of their interventions and constructing their own interpretations of the phenomena and the results of the manipulation. Meaningful learning requires learners who are actively engaged in a meaningful task in which they manipulate objects and parameters of the environment they are working in and observing the results of their manipulations.

(ii) Meaningful Learning is Constructive (Articulate and Reflective):

Activity is essential but insufficient for meaningful learning. We must reflect on the activity and our observations, and interpret them in order to the lesson the activities has to teach.

(iii) Meaningful Learning is Intentional (Reflective/Regulatory):

Human behavior is naturally goal-directed. When students actively try to achieve a learning goal that they have articulated, they think and learn more. For students to experience meaningful learning, they must be able to articulate their own learning goals and monitor their own progress. When learners are actively and willfully trying to achieve a cognitive goal, they think and learn more because they are fulfilling an intention.

(iv) Meaningful learning is Authentic (complex and contextualized):

Thoughts and ideas rely on contexts in which they occur. Presenting facts that are stripped from their contextual clues divorces knowledge from reality. Learning is meaningful, better understood and more likely to transfer new situations when it occurs by engaging with real- life complex problems. There are evidences that most contemporary research on learning has shown that learning tasks that are situated in some meaningful real-world task or simulated in some case-based or problem-based learning environment are not only better understood, but also are more consistently transferred to new situations.

(v) Meaningful learning is Cooperative: (collaborative and conversational)

Since we live, work and learn in communities, naturally seeking ideas and assistance from each other, and negotiating about problems and how to solve them. Meaningful learning therefore, requires conversations and group experience.

These characteristics of meaningful learning are interrelated, interactive, and interdependent. This implies that learning and instructional activities should engage and support combinations of active, constructive, intentional, authentic, and cooperative learning.. The conclusion here is that learning

activities that represent a combination of these characteristics result in even more meaningful learning than the individual characteristics :

would in isolation. The synergy between these characteristics can be illustrated as shown in the diagram below:

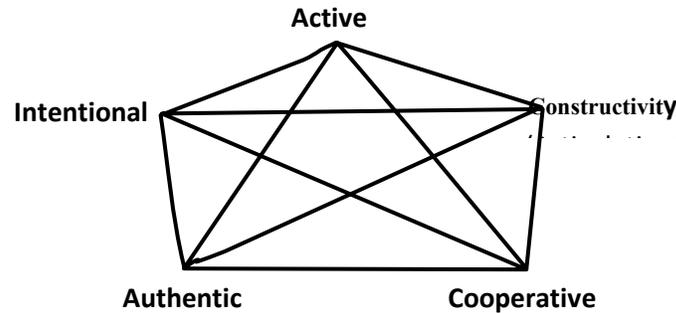


Figure 1: The Characteristics of Meaningful Learning: (Adopted from Johansson, 1997),

3.0 Methodology

3.1 The Addie Model of E-Learning Development

Good design and planning are crucial for every type of training programme but it is exceptionally crucial in the development of an e-learning courses. This is because in the traditional face-to-face classroom structure, the largest effort is in the delivery sessions, while in e-learning, it is the design and development of structured materials which must be self-contained and able to be used multiple times without making ongoing :

adjustments is the main target that must be achieved. There are many instructional systems design approaches, but the one used in this research was the ADDIE model. ADDIE model is a model that employs five stages of Analysis, Design, Development, Implementation, and Evaluation. This model can be illustrated diagrammatically as follows:



Figure 2: The ADDIE Model Software Development (Source: A guide for designing and developing e-learning courses by Ghirardini, 2011)

- The Analysis stage: The need analysis allows the identification of general high level course goals. Target audience analysis seeks to determine the key characteristics of learners (e.g their previous knowledge and skills, learning content, access to technology etc. Task analysis identifies the learning goals the learners should attain or improve on and the knowledge/skills that need to be developed or reinforced while the topic analysis is carried out to identify and classify the course content.
- Design: The design stage encompasses (a) formulating a set of learning objectives required to achieve the general high level objectives, (b) Sequencing which involves defining the order in which the objectives should be achieved.(c) Instructional strategy which involves selecting instructional media, evaluation and delivery strategy. The outcome of the design stage is a blueprint(illustrates the curriculum structure) that will be used as a reference document to develop the course.
- Development: Here the e-learning content is actually produced. The content vary considerably depending on the available resources. The development of the multimedia interactive content is comprised of three main steps (a) Content development which deals with writing or collecting all the required knowledge and instructions. (b) Storyboard development which deals with integrating instructional methods (all the pedagogical elements needed to support the learning process) and media elements to produce a document that describes all the components of the final product. (c) courseware development: This deals with developing media and interactive components, producing the courses in different formats for cd-rom and web delivery and integrating the content elements into learning platforms that learners can access [7].

- Implementation: At this stage, the course is delivered to learners. The courseware is installed on a server or cd-rom and made accessible to learners.

- Evaluation: There are always different kinds of evaluation. One may want to evaluate learner's reaction, the achievement of learning objectives, impact of the courseware on learner's etc

Following this model, a design was made and implemented using Visual Basic 6.0 programming language and other tools.

3.2 Authoring Program Modules

Each lecture material is expected to be structured into chapters, sections and frames. It is structured in such a manner that the author is usually prompted at the starting point to supply every information and parameters of his lessons. When this information are supplied, there are used to generate the author's "rootname" for his course. On completion of the above procedures, a filename is generated for each lesson. This filename is usually a concatenation of the "rootname", chapter number, section number and the first three letters on the lesson counting from the left. The above process is repeated for all the chapters in the instructional materials. The overall process as explained above is tagged "file uploading". Clicking the upload button after generating the filename helps you browse the location where your lesson content is saved and then load it into a rich text box. The implication of this is simply that all the lessons must be saved with .rtf extension. This is because the lessons are also meant to be displayed in rich text boxes. To bring this explanation home, let us show a typical structure of a courseware on a topic. Let us assume that this topic is made up of N number of chapters. Each chapter in turn is made up of M number of section and each section in-turn is made up Z number of frames . We should however

take note of the fact that the number of chapters, sections and frames varies from lesson to lesson. The structure of the lesson

can be illustrated as shown in the figure below:

Level 1 <u>Chapters</u>	Level 2 <u>sections</u>	Level 3 <u>Frames</u>
Cp 1	Cp 1,1	Cp 1,1,1 Cp 1,1,2 Cp 1,1,3
Cp 2	Cp 2, 1 Cp 2, 2	Cp 2, 1,1 Cp 2, 1,2 Cp 2, 2,1 Cp 2, 2,2
Ch 3	Cp 3, 1 Cp 3,2	Cp 3, 1,1 Cp 3, 1,1

Figure 3: Authoring Program Modules Indicating Chapter Structure on a Courseware

Where	Cp 1	stands for chapter one
	Cp 1,1	stands for chapter one, section one
	Cp 1,1,1	stands for chapter one, section one, and lesson one
	Cp 2	stands for chapter two
	Cp 2,1	stands for chapter two, section one
	Cp 2, 1,1	stands for chapter two, section one, and lesson one
	Cp 2,1,2	stands for chapter two, section one, and lesson two

From the above figure, chapters are taken first, followed by sections and lastly lessons.

3.3 System Analysis of the Authoring Model

To produce a workable authoring system, one must first analyze what is on ground, and further look into the parameters needed for the software to be functional. The requirement analyses of this work surveyed among other things the following.

- The ability of the software to accept user inputs (lesson materials)

- Ability to make use of the supplied parameters to customize lessons into courseware irrespective of the course.

- Ability to also present the customized courseware to students in an interactive manner.

- The authoring software should also be able to assess the students at the end of each lesson and grades them automatically.

3.3.1 System Specification

To help realize this authoring software, we first considered the roles lectures/trainers play in educational and training systems as stated by G. Davies [4]. The roles include among others the following:

- The lecturers/trainers are a presenter of instructions using simple media and materials as aid to the presentation process.
- The lecturer/trainer is a manager of instructional resources, which learners use as an individual or small group basis.
- Also Lecturers/trainer are users of computer assisted, interactive instructional systems, whether classroom based or delivered at a distance.

The most important point which we must emphasize here is the fact that any lecture material(s) to be used as instructional materials for e-learning must be those that have been tested on students using the traditional approach. The materials should also be of good quality and easy to understand. It is also worthy of note that for

every e-learning course to be effective, all authors should at least embrace the following points as given by D. Stephens D. [15] [17]

- Write about what he or she knows or cares for.
- Approach people through their own interest, rather than that of the writer.
- Should not let the reader hover in uncertainty: The author should make it plain.
- The author should start from what is easily grasped and proceed to the unfamiliar and difficult concepts
- Illustrates his/her points with concrete examples and through people rather than abstraction.
- Treat learners with respect.

3.3.2 System Design

Following the detailed analysis made, a model design for the authoring system was made and in turn implemented. Shown below are some sample design of the different modules that constitute the authoring software.

Figure 4a: The form Design for course properties. With this form the Author supplies BookID/CourseID, chapter number, chapter title and number of sections.

Figure 4b: The form Design for Section properties. With this form the Author supplies section title, section number, and number of lessons in that section

Figure 5a: The form Design for Lesson properties. With this form the Author supplies section number, Section title and Lesson title

Figure 5b: The form Design for uploading a lesson. With this form the Author can upload a lesson saved in any word editor such as word pad, Microsoft word etc

After the design, it was coded using Visual basic 6.0, hyper text markup language (HTML) integrating Microsoft Agent and Microsoft Access at the back end .The general interface of the authoring system is as shown in the figure below

:



Figure 6: The Main Interface of the Authoring Software

The main interface is made up of four different options. Option one is the main program. It is the main program option that enables an author to customize his lessons to suit his unique choice. The main program option also presents the courseware generated to learners/students. However, a new user who is not familiar with e-learning environment (both authors and students) may wish to first visit the users' guide to enable him/her gather the necessary basic information that will help him kick start his operations in this software. The users' guide is a help information provided basically for new users but also serves every other user.

The users' guide provides information on issues like the necessary information expected to be supplied by an author, the structure of e-learning courses and other fundamental things a user should know. When a user wishes to make inquiries about a particular course or know generally about authoring software and e-learning, he could post such through inquiries menu.

A new user must first register before he can gain access to either author his lesson or study any course of choice. Immediately you log on to the site and click on main program menu, a form is loaded for you. When you select yes, authentication form will be loaded for you. When you select No, registration form will be loaded for you. The authentication forms are shown below:



Figure 7: The Authentication Forms for Users

After authentication, the system will now load for you the main interface where you can author your course or take your lessons

on your own. Shown below is the main interface:

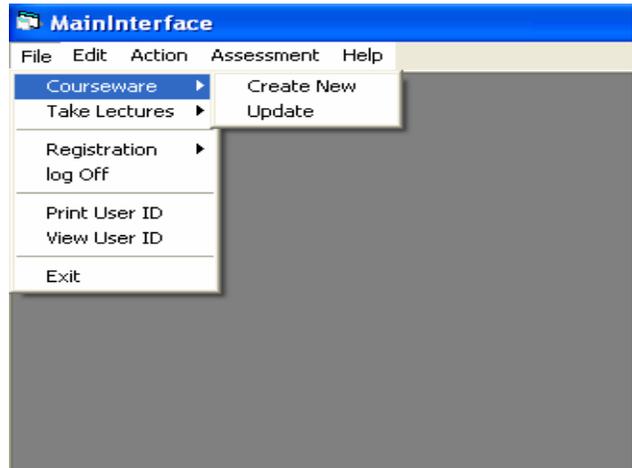
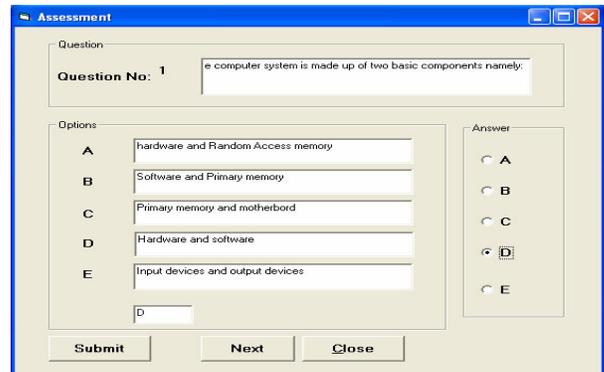
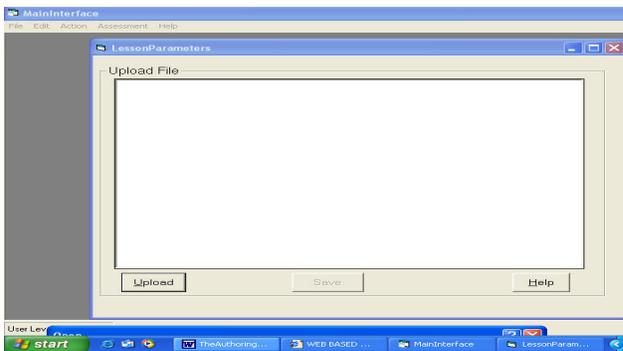
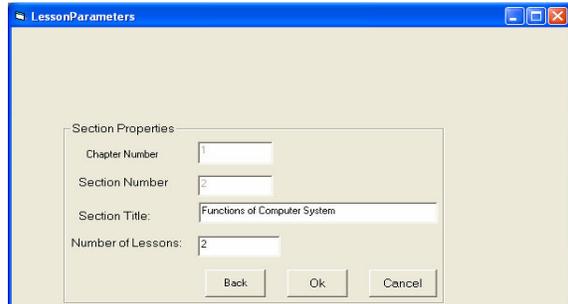
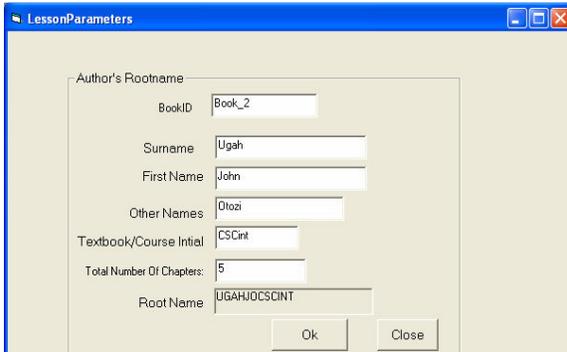


Figure 8: The Authoring and Learning Interface

Other interfaces in authoring lessons are show in the figures below:



The uploaded lesson will be like those in the form shown below:

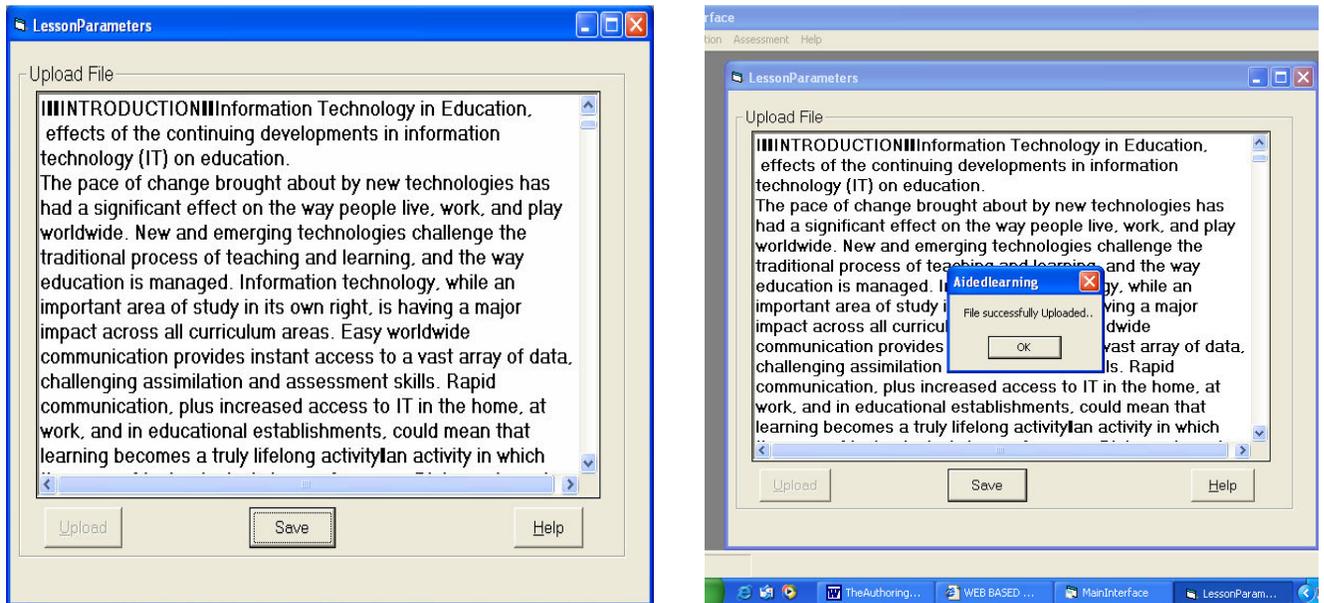


Figure 11: Loaded Lesson from a file in Microsoft Word

A sample of the assessment form for a student being assessed is shown below:

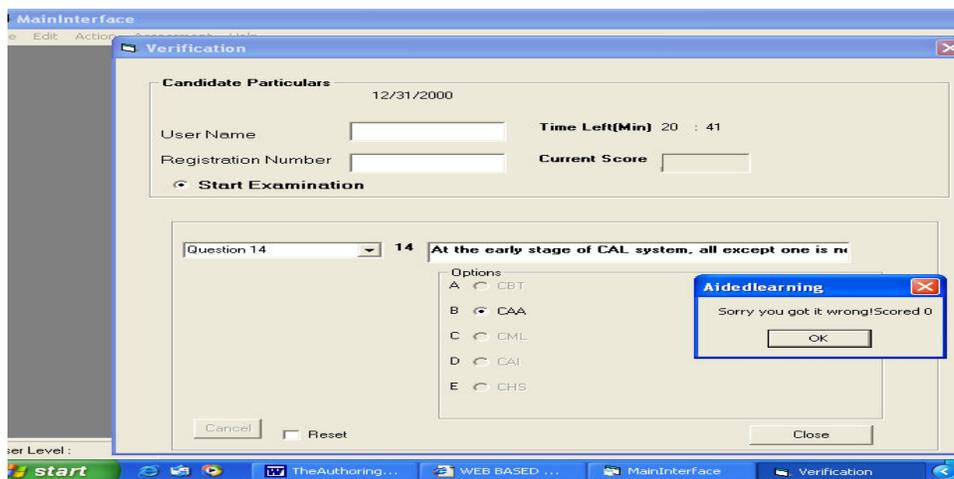


Figure 12: A form Showing a platform for e-assessment using the Authoring System

The lessons are structured into chapters, sections and lessons as explained in earlier

on. The figure below shows a typical sample

of an authored courseware showing the lesson structures and the lessons themselves

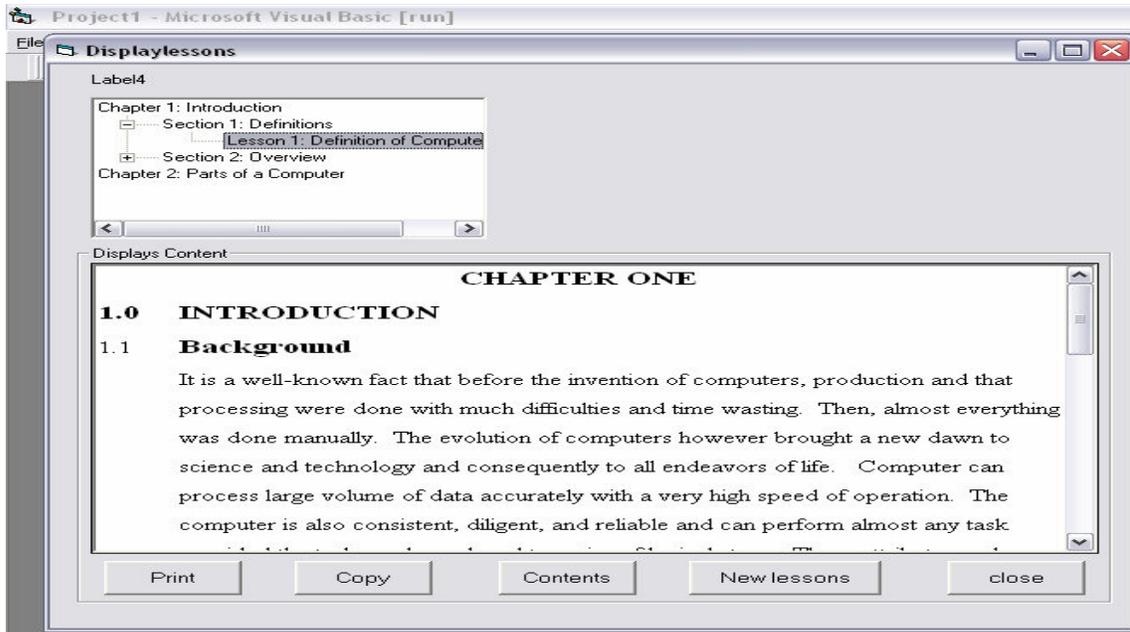


Figure 13: A Display of lessons already Authored using the model

Shown below are some forms for displaying the details of authors and student particulars.

The other form give us a platform to assess the help facilities of the authoring system.

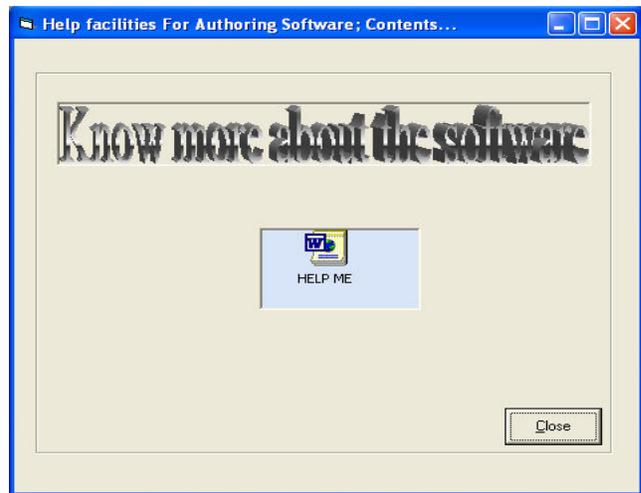
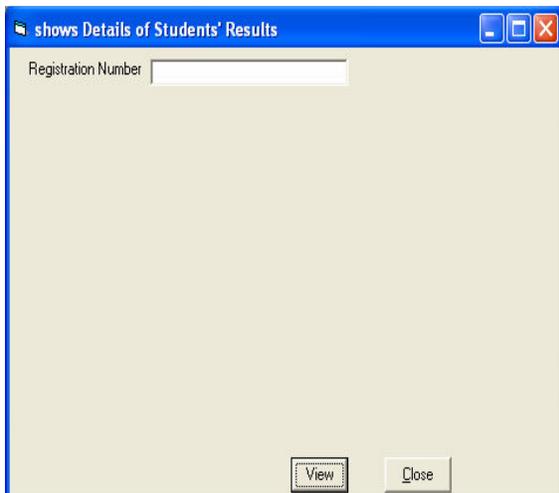


Figure 14: Form for Student details and Online Help

There are some other forms that help a user to remember and recover his personal particulars when forgotten. There are also

other forms to help a user achieve his interest. Some of these forms are shown below:

Figure 15: Other Output forms

4.0 Discussion and Conclusion

Technological advancement in our age has clearly turned our present day society to a knowledge driven society. It is now clear that we all need a lifetime to become skilled members of the society. In view of this need, tradition face-to-face classroom of teaching and learning must be enhanced and a technological-driven method of teaching and learning adopted to help both full-time students and part-time students meet up with the challenge of lifetime learning. E-learning is a technology driven learning that employs information and communications technology in the preparation and dissemination of learning materials to students. However, in order to make things easier for computer programmers and also give room for non-computer experts to easily prepare and distribute their subjects to their students, we need an authoring system to help us achieve that. Authoring system permits the

development of true multimedia applications. The software is suitable for use in primary, secondary, tertiary institutions and other training centers. A model of an authoring system for e-learning was developed, tested and found to be effective in teaching and learning in our present day information driven society. Moreover, e-learning reaches a wide target audience by engaging learners who have difficulty attending conventional classroom training because they are geographically dispersed, busy with work or family, located in conflict and post conflict areas or those that face difficulties with real time communication (very shy once) and those limited from participating in classroom sessions due to cultural or religious belief. We are confident that this model of authoring software will be of good help to teachers, trainers and students of this age.

5.0 Recommendations

Having gone through this research, we discovered that there are certain areas in teaching and learning which we could not handle. We hereby make recommendation on the following for improvement on such system.

- Effort should be made to develop an authoring system with in-built intelligence. This software will be a direct application of artificial intelligence to develop a special authoring system for e-learning that will have the ability to learn. Intelligent authoring system will have many sensitive advantages when compared to this conventional one developed.
- There is also a need to have a Special Purpose authoring system to develop courseware for the disabled. Whereas typical teaching methods are suitable for normal

learners, different categories of disabled need unique attention.

- Effort should also be geared towards developing authoring systems that will handle Simulation and Virtual Reality: This will enable us create 3 dimensional near- to-real environments for simulator systems. Such applications is not only useful in our higher institutions but is also applied to other areas such as flight sailing training systems. This type of software also has an important role to play especially for blind and nearly blind peoples' education.
- An authoring system that will effectively handle distributed system to harness the modern worldwide networks and high-speed digital and mobile communications is also needed.

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