

Design of A Computer Assisted Instruction in Teaching Some Concepts in Biology Studies

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ABSTRACT

Virtually in all field of endeavour, the application of Computer cannot be emphasized considering the benefits accruable to the use of Computer Assisted Instruction (CAI) in our schools and non-availability of qualified science teachers to teach some science subject, it is advisable to use computer in conjunction with teacher to present course contents to the students. Therefore, this study involves the design and development of a simple Computer Assisted Instruction (CAI) tutorial package for teaching some selected topics in Biology for secondary schools. The application was designed using the Visual Basic Interpreter on Windows Operating Systems, while the topics covered include Ecology, Respiratory system, Cell theory, Digestive system and Physiology. This application contains lecture notes on each of the selected topic presented in simple English. The application also comes with feedback questions for self-evaluation upon completion of the usage of the tutorial. For effective implementation of the system, school management should put in place adequate facilities and both teachers and students should be well trained in how to effectively use the system.
Keyword: CAI (Computer Assisted Instruction)

Keywords: Design, Computer Assisted Instruction, Teaching, Concepts, Biology Studies

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1. INTRODUCTION

Biology occupies a unique position in the school curriculum. Biology as a subject is a core prerequisite to many science related fields like medicine, pharmacy, agriculture, nursing, biochemistry and so on. It is a well-known fact that no student intending to study these disciplines can do without effectively passing biology in secondary school. This factor, among others, have drawn attention of researchers and curriculum planners towards biology as a subject in the school curriculum Kareem, (2003) as cited by Yusuf and Afolabi (2010). However in spite of the significance and popularity of Biology among Nigerian students, performance at senior secondary school level had been poor Ahmed (2008) as cited by Yusuf and Afolabi (2010). Consequently the desire to know the reason accounting for the poor performance in Biology has been the focus of researchers for some time now.(Abdullahi, 1982; Bajah, 1979; Ogunniyi, 1979; Kareem, 2003) as cited in Yusuf and Afolabi(2010) have all observed that poor performances in the sciences (Biology inclusive) is caused by a plethora of reasons which include poor quality of teachers, overcrowded classrooms, and lack of suitable and adequate science equipment among others. Also students perform poorly because the biology classes are usually overcrowded and heterogeneous in terms of ability levels. In addition to ill-equipped laboratories and an overloaded biology syllabus (Ajayi, 1998; Ahmed, 2008,) as seen Yusuf and Afolabi (2010).

Consequent upon the above, it is inherent to not only know the causes of poor performance of students in biology but to further research ways to improve performance. In the computer age that we find ourselves in the world today the introduction of computer and its application to solve problems in education is not strange. One of the ways is to develop a Computer Assisted Instruction (CAI) tutorial package for Biology to compliment the lessons taught in a conventional class. From his review of empirical studies on CAI Cotton (1997) as captured by Yusuf and Afolabi (2010) concluded that among other findings, using CAI as a supplement to conventional class produces higher achievements than the use of conventional instruction alone, research is however inconclusive regarding the comparative effectiveness of conventional instruction alone and CAI alone, and that computer-based education (CAI and other computer applications) produce higher achievement than conventional instruction alone.

In addition, students learn instructional contents faster with CAI than with conventional instruction alone, they retain what they have learned better with CAI than with conventional instruction alone, and CAI activities appear to be at least as cost effective as and sometimes more cost-effective than other instructional methods, such as teacher-directed instruction and tutoring. However, the potential benefits of a student having a CAI tutorial that will compliment what has been taught in class to study with during his/her free or study time either at home or in school will go a long way at improving learning. This is because the learner will be able to move through the topics at his/her own pace with respect to his/her ability level. It will also provide opportunity to revisit aspects of the lesson which is not understood again for better understanding. This highlighted features will not only make learning more interesting and enjoyable but it will lead to the much desired improvement in performance.

1.1 Computer Assisted Instruction Tutorial Package

A computer Assisted Instruction (CAI) is simply defined as the use of computers and software applications to teach concepts or skills(www.encyclopedia.com). While Arnold (2000) defines it as a diverse and rapidly expanding spectrum of computer technologies that assist in teaching learning process. It is also known as Computer Aided Instruction. Examples of CAI include guided drill and practice exercises, computer visualization of complex objects e.t.c The focus of the research is to develop a CAI tutorial package for teaching some selected topics in Biology. The topics covered include Ecology, Respiratory system, Cell theory, Digestive system and Physiology. This application is developed in Basic programming language using Visual basic 6.0 interpreter. The software also has an evaluation and feedback interface which can enable the user perform personal assessment after using the tutorial package.

1.2 Characteristics of Computer Aided Instruction

In specific terms, the characteristics of Computer Assisted Instruction are as follows:

- i. It has the capacity to initiate flexible interactions with the student.
- ii. The computer is able to record and store all the responses of the students.
- iii. It can use the information in deciding what information to give the student next.
- iv. It can branch not just in terms of one answer but also in terms of a whole series of previous answers.

However, there are some basic assumptions of CAI and are stated as follows:

CAI can be provided simultaneously for as many as 4000 students. CAI is suitable for all types of teaching and learning activities. As the learner's performance is going to be recorded automatically in computer memory, immediate feedback can be provided to the learners by the teachers and also the teachers can use the data in making the best teaching strategy for the learner in future (Vanaja and Rajasekar, 2007).

1.3 Objectives of the Study

The research is aimed developing a Computer Assisted Instruction (CAI) in teaching some selected topics of interest in Biology. However the primary objectives are as follows:

- i. To determine the topics to cover in Biology
- ii. To develop a lesson plan and content for the selected topics
- iii. To develop a software/program which is a Computer Aided instruction application based on the selected topics
- iv. To test the computer Aided Instruction program in an ideal classroom.

1.4 Statement of Problem

According to research findings it has being established that, Nigerian students exhibit poor performance in Biology in secondary schools. Several factors have been identified as causes of this poor performance. However some of the identified causes are overcrowded classrooms, ill-equipped laboratories among other causes. It is only inherent to desire to find solutions to these causes of poor performance. One way to this is to innovate better teaching techniques which leads us to the development of CAI tutorial package which can be used to complement the conventional way of teaching or used alone.

2. DESIGN OF THE APPLICATION

The design of the application is divided into two parts

- i. The development of the content for the application
- ii. The development of the code for the application

The Development of the content for the application.

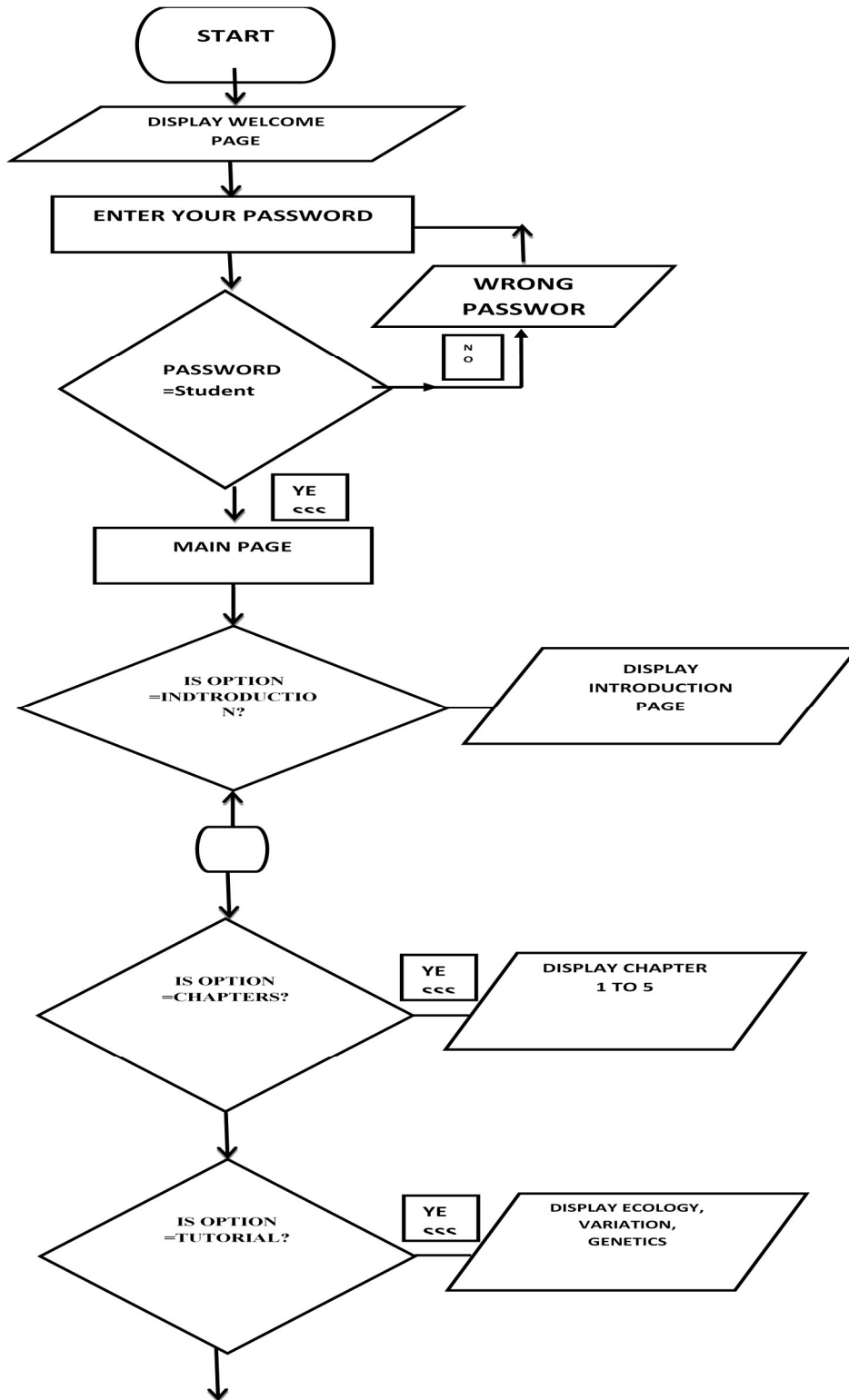
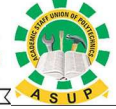
The following topics were selected to make up the topics for our CAI, they are itemized below:

- i. Ecology
- ii. Respiratory system
- iii. Cell theory
- iv. Digestive system
- v. Physiology

The content was developed by a member of the team who is a specialist in the field of biology. The evaluation questions were also developed for each of the topics to cover by the tutorial.

The development of the code for the application.

The development of the code started by developing a flow chart that will represent the processes involved in the software application. The flow chart representation is shown in figure 1.0 below.



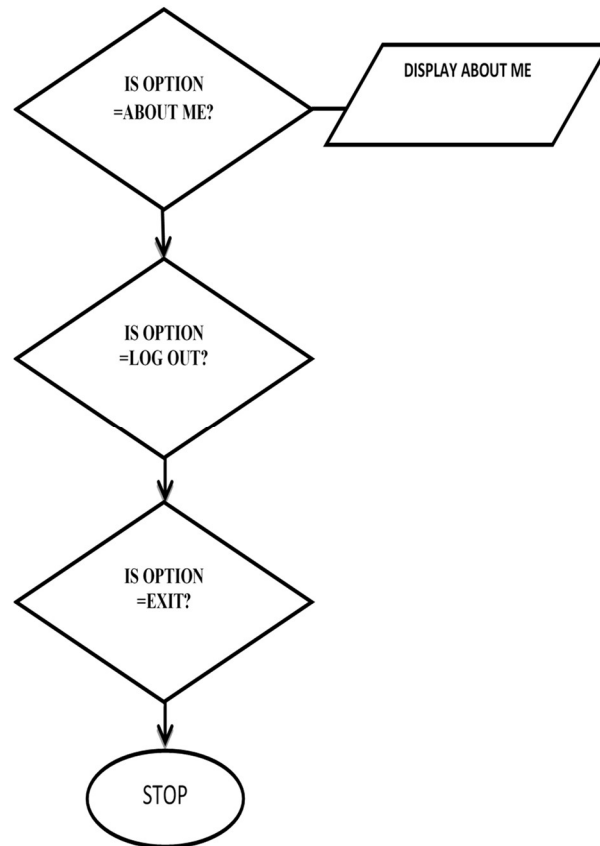


Figure 1: The flow chart for the program

The flow chart gives the programmer a better guidance when writing the code for the program. The program code is written in Basic programming language and using the visual basic 6.0 interpreter. This is because it has a large library or utility object-oriented support, which allows users to create simple Graphic User Interface(GUI) application. Visual Basic is a common Interpreter associated with most personal computers or microcomputers and the same program can be run on different microcomputers with little or no modifications to the code. A screen capture of the Visual Basic Interpreter development environment is seen in figure 2.0 below.

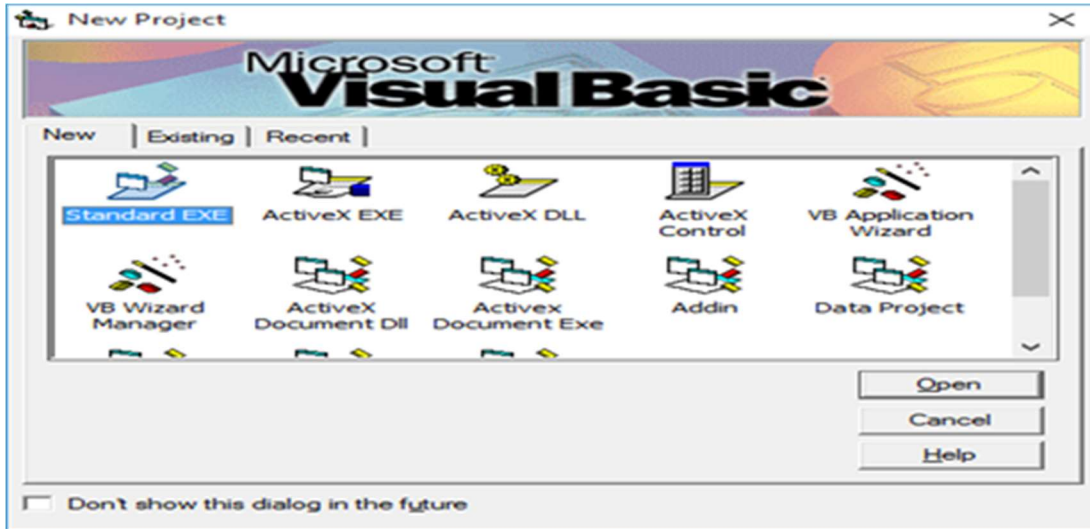


Figure 2: The screen shot of the visual basic interpreter development environment.

3. RESULTS AND DISCUSSIONS

At this stage the program code has successfully been tested and debugged for any errors that might have effect on the output of results. After which our application is ready for trial, then use. However we went further to get feedback from fifty individuals (students and teachers), which was based four qualities which are resourcefulness, usefulness, learnable, and recommendable. The user interface of the application, interact with the user at different stages, which include user registration (the user is meant to register a user name and password which the application will identify the user with), its also prompts for user inputs as the user progresses through tutorial application. The user interface of the Application at different stages of the tutorial is shown in the screen shots in the figures below:



Figure 3: This screenshot Show the login page in Application window

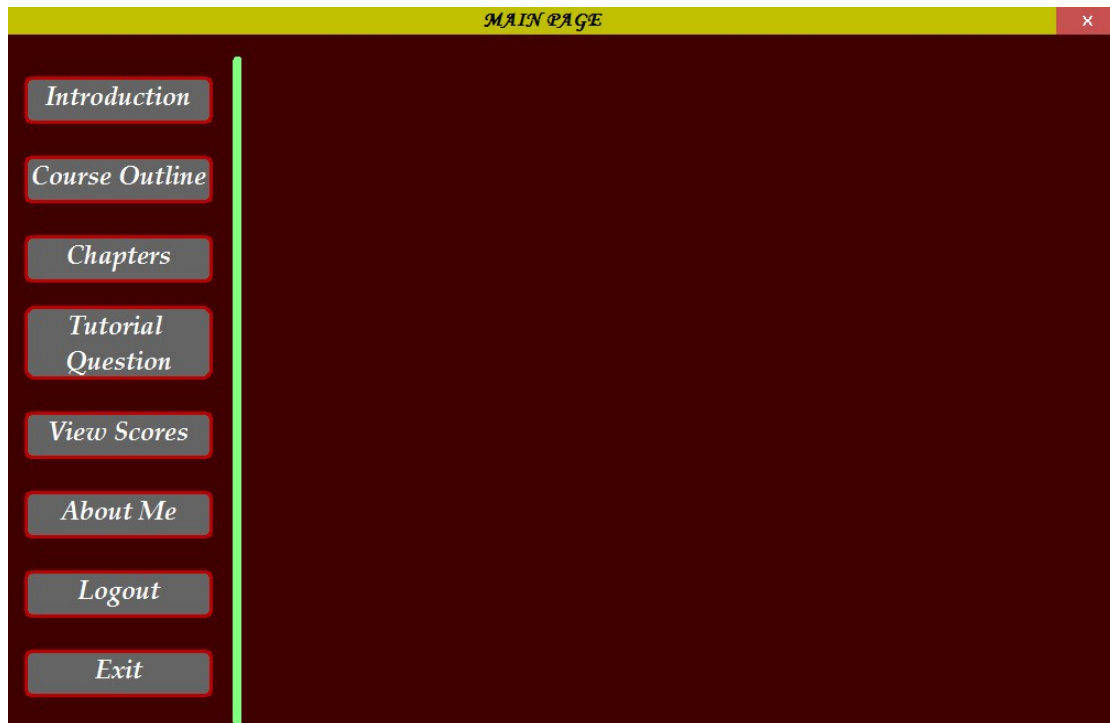


Figure 4: This screenshot Shows the (overview) introduction page in Application window

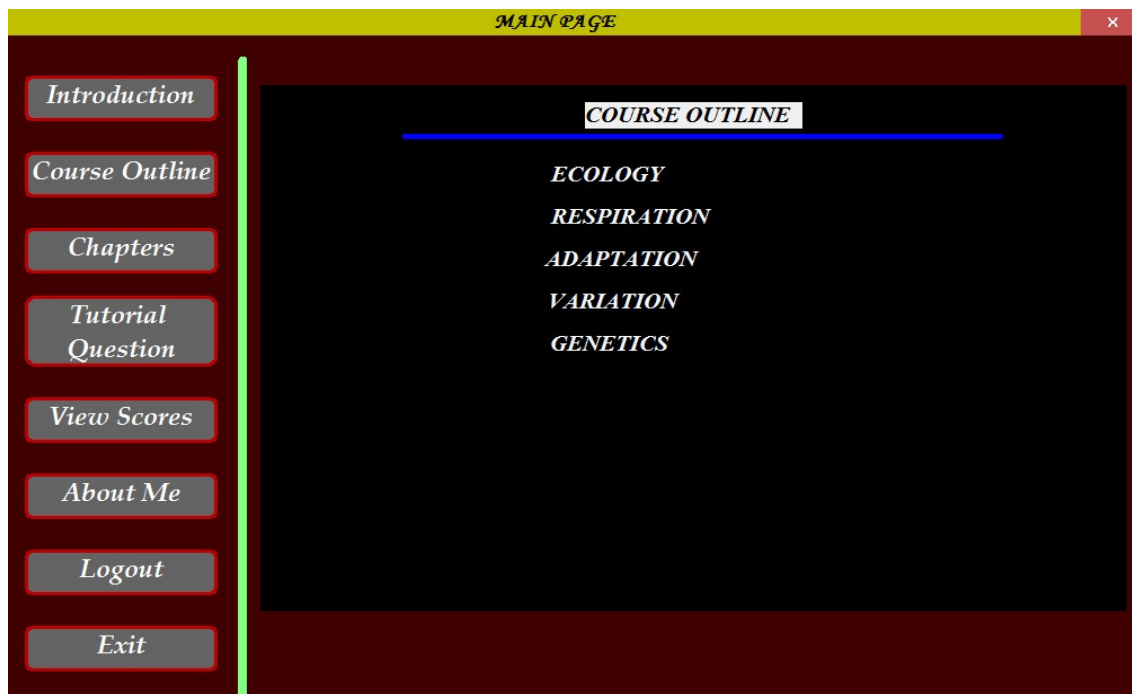


Figure 5: This screenshot Show the course outline page in Application window

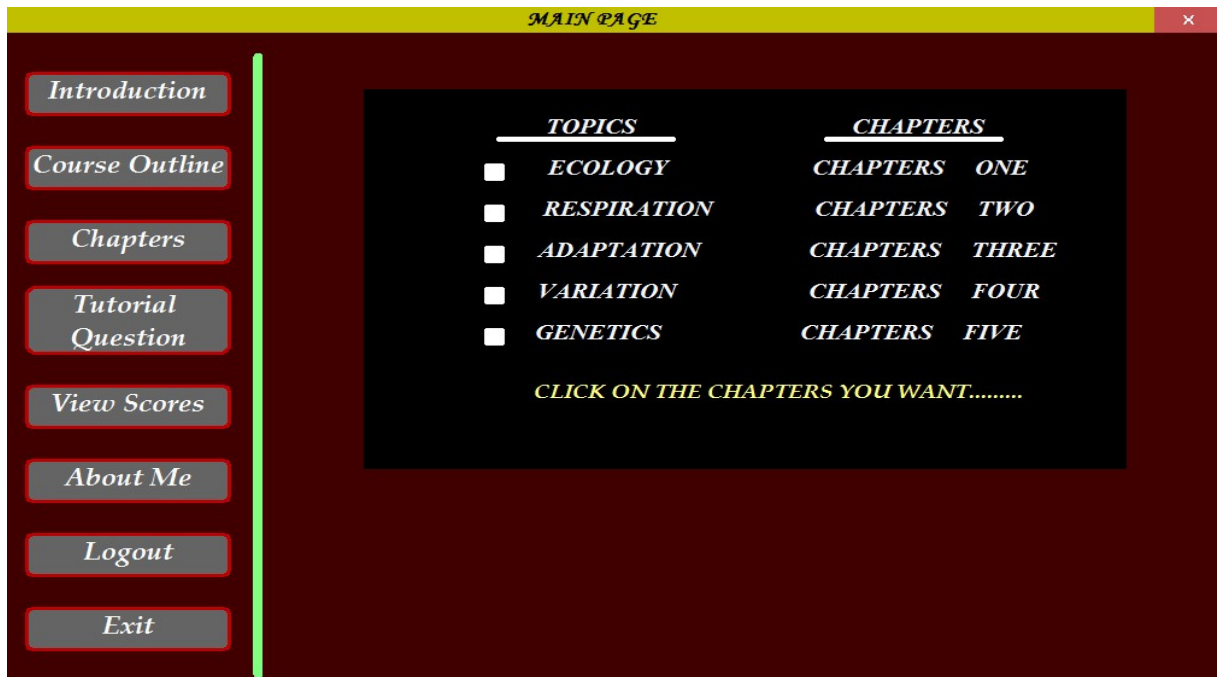
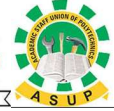


Figure 6: This screenshot displays the different topics covered and the chapters

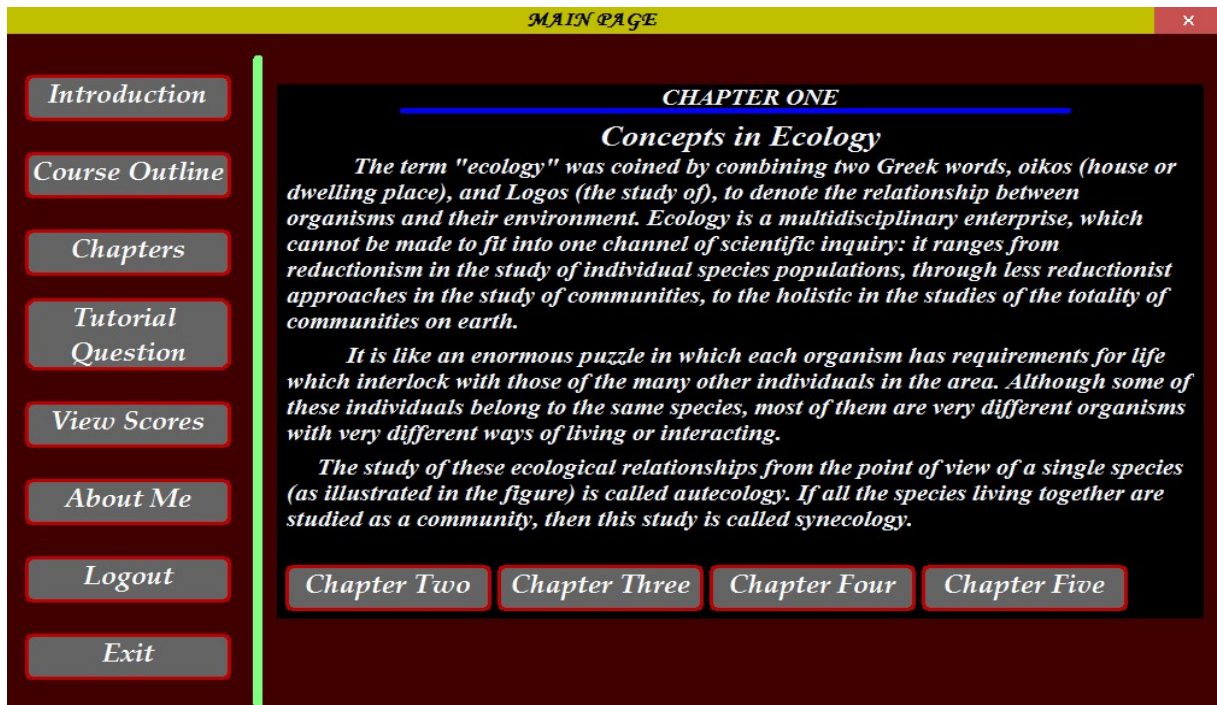


Figure 7: This screenshot displays the content of chapter one

4. EVALUATION QUESTIONS AND FEEDBACK

The evaluation questions at the end of the tutorial help to reinforce learning. The application package also provides for retrieval a second time in the event of a user misses the answer at first attempt, after the second attempt if the answer is still wrong then the system goes ahead to display the appropriate response. The interface that displays the questions is shown in the screen shot below:

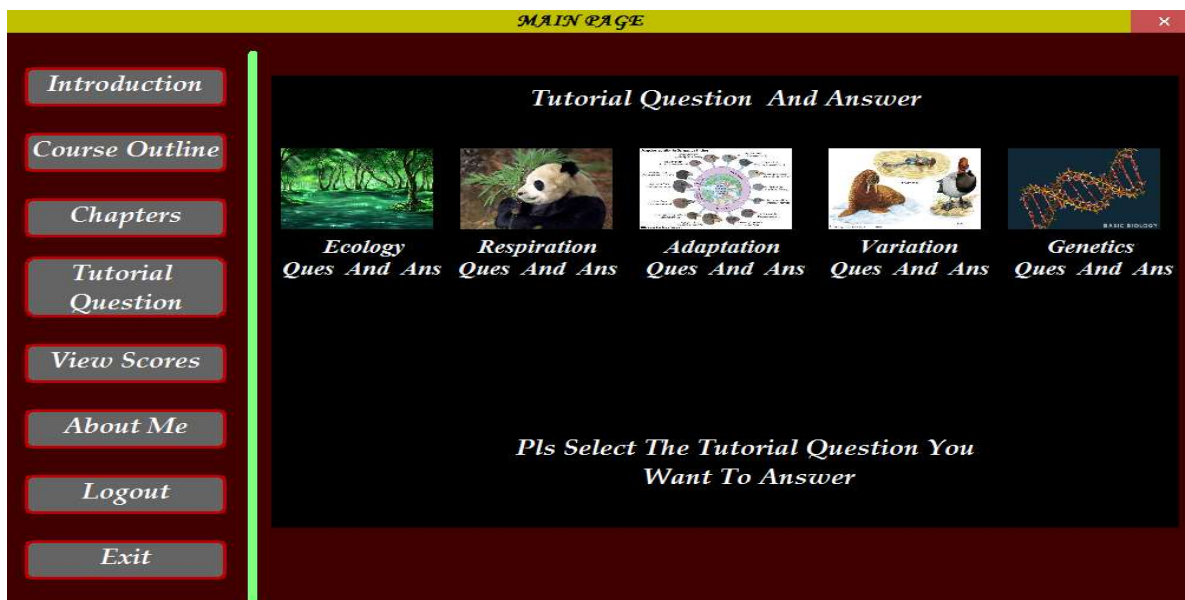


Figure 8: The Tutorial Questions and Answer window.

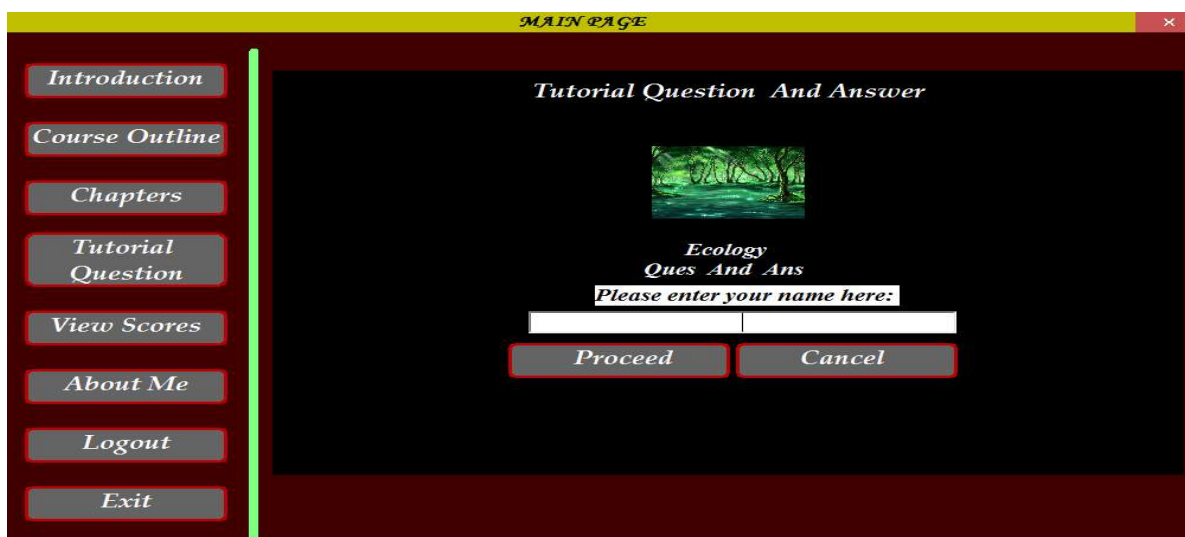


Figure 9: This screen shot shows when the question Ecology is selected.

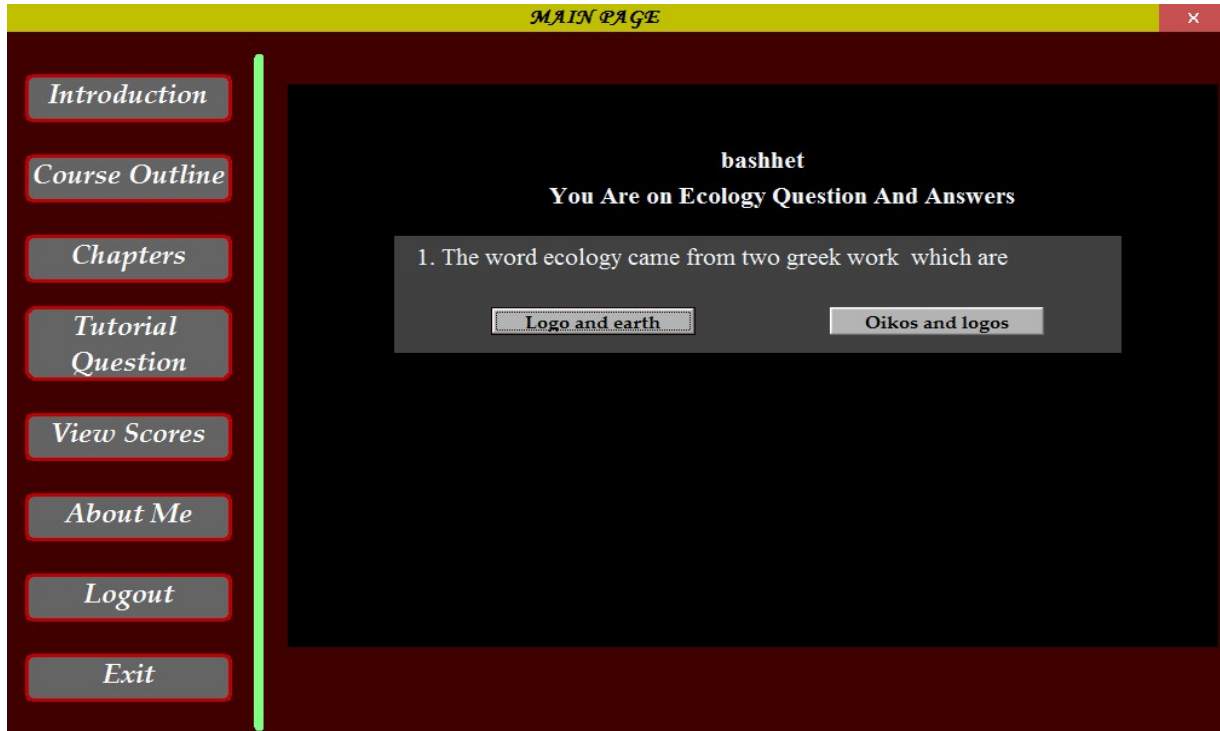
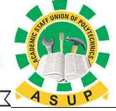


Figure 10: A screen shot displaying a typical question.

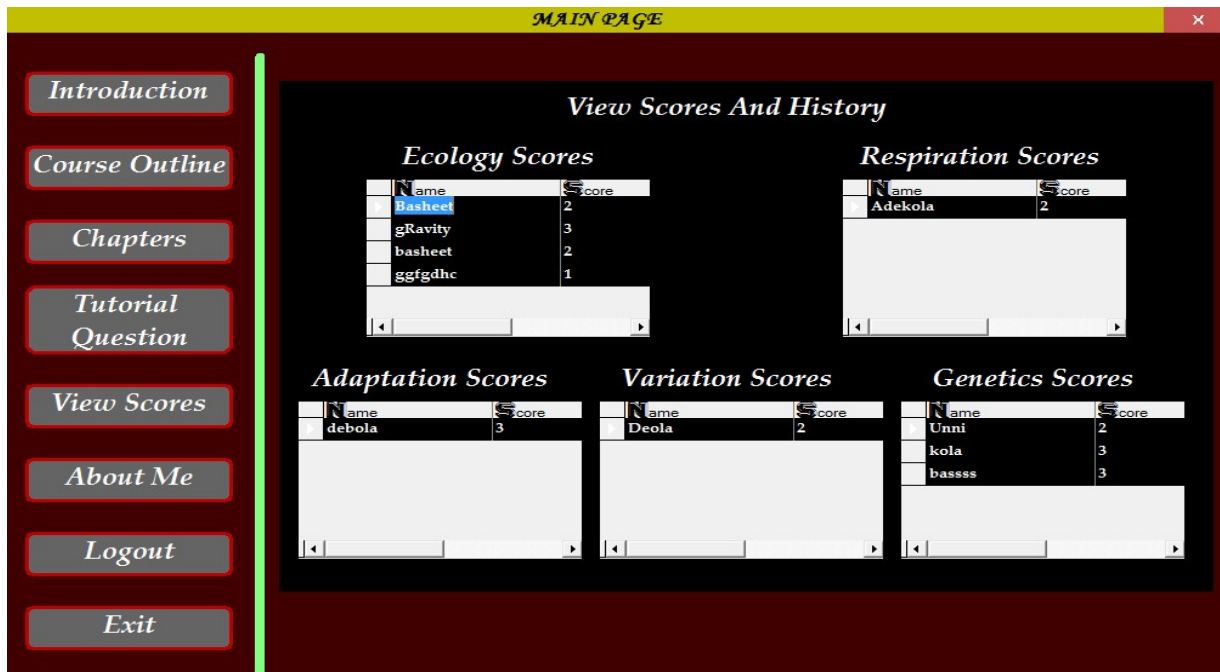


Figure 11: Shows the score history of the users.

User feedback after using the Application

To further buttress the workability of the application a total of fifty (50) individuals (consisting of both students and teachers) were given the opportunity to use the application. These individuals were selected at random. Each individual was given a form to fill. They provided feedback based on a four point grade scale of resourcefulness, usefulness, learnability and recommendability of the tutorial application package. Their responses are tabulated below:

	Not (No. of ind.)	Quite (No. of ind.)	Just (No. of ind.)	Very (No. of ind.)
Resourceful	03	05	20	22
Useful	0	06	23	21
Learnable	2	04	19	25
Recommendable	0	03	10	37

Key: No.of ind. = Number of individuals

Table 1.0 User feedback after using the application

The values in the table are represented in the bar chart in figure 12.0 below.

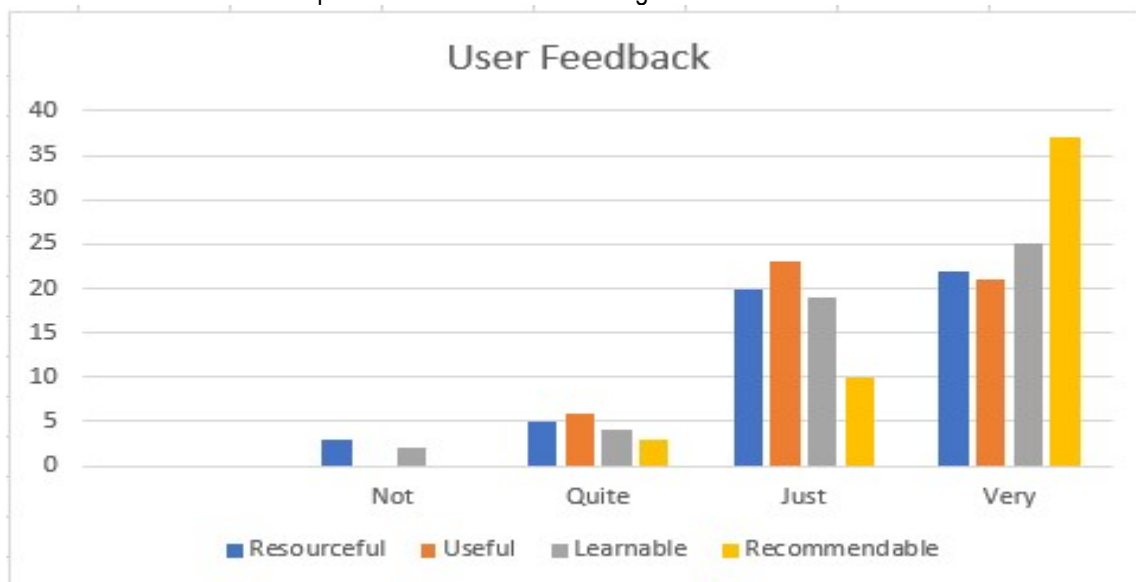


Figure 12.0 Bar chart of the feedback of respondents

From the bar chart it can be concluded that the application is rated resourceful, useful, learnable and recommendable.

5. CONCLUSION

In conclusion, it is observed that the purpose of this research has been achieved with respect to the stated objectives. A Computer Assisted Instruction (CAI) tutorial package for teaching biology is developed. The application covered only some topics in biology which include Ecology, Respiratory system, Cell theory, Digestive system and Physiology. We also gathered feedback from individuals who were given the opportunity by the team to test the workability of the application. From the analysis of the data elicited from them, it can be deduced that the application is rated resourceful, useful, learnable and recommendable. It is hoped that using this application to enhance and complement the traditional teaching and learning of biology in secondary schools will translate to improved performance.

6. RECOMMENDATIONS FOR FUTHER RESEARCH

This application package can further be improved by including

- i. More graphical structures, like pictures video, animation etc.
- ii. These packages should be implemented immediately for the benefit of students and teachers in Biology class.
- iii. Adequate computer system should be acquired in to all secondary schools across Nigeria for the proper presentation of these packages.
- iv. Teachers teaching science subjects should be sponsored for I.C.T. Training.

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