

Multimedia Web Based Content for E-Learning

Edim Azom Emmanuel, Ofem Ajah Ofem, Akinremi Peter Taiwo

Abstract— Multimedia implementation in e-learning has changed the way students learn, and how information is gathered and interpreted. E-learning provides opportunity for students and their teachers to have continuous interaction even outside the class room environment. The aim of this study is to develop a multimedia content platform that will enable students use multimedia content for e-learning in order to support class room teaching and improve their learning experience. The use of multimedia web-based content for e-learning is an attempt to extend learning outside the classroom, engage the students at any time and enhance their performance. During the study, we applied a user centered approach and interacted with the potential users. Qualitative and quantitative data were collected during the study and development of the application. The application allows peer to peer collaboration among the students and with the teachers. The application was evaluated by the intended users. The evaluation results show that multimedia content used for e-learning can enhance students' performance, self-exploration, and learning experience. The students were encouraged and excited to study lecture materials in different formats. The study shows that multimedia content for e-learning has enable the students to make significant improvement in the understanding of their course content and performance.

Index Terms—Multimedia technology, E-learning, Multimedia content, Information and Communication Technology.

I. INTRODUCTION

The interactive nature of multimedia technology makes it easy to enhance teaching and learning beyond the traditional method of teaching and learning [1]. The learners are able to adopt individual learning strategies due to the flexibility it provides. A multimedia content e-learning platform will enable the teachers or instructors and learners to interact with one another in an informal environment with minimum difficulties. The interactions and the teaching and learning processes are extended beyond the class room. The platform also encourages and enhances peer learning as well as individual creativity and innovation. One key characteristics of multimedia technology is the capability to integrate different media, such as text, picture, audio, animation and video to create knowledge material, cultivate the reading interest and the enthusiasm of the learner [2], [3].

The Internet and the World Wide Web offers a medium for making multimedia content available for sharing, dissemination and for learning purposes. An e-learning platform can provide the students with tools for collaboration and self-exploration. Students will be able to read lecture material and be more familiar with it as well as concentrate on

new knowledge. They will have the lecture material in different perspective or mode of presentation and this will enhance their learning experience. Multimedia presentation on an e-learning platform is a tool has become a tool for educating multidisciplinary masses as well as students with different capabilities. With multimedia content, large amount of information can be provided effectively compared to several pages of text materials. Multimedia content provides a constructivist learning environment [4]. Multimedia technology changes the way students learn and obtain various information as well as in interpret information. The students are able to explore, collaborate and take active participation in the learning process in order to solve problems. Multimedia as an educational technology provides multi-modal interaction and enormous potential to impart flexible and life-long education to heterogeneous mass learners [5].

Information and Communication Technology has generated interest among educationist, states, and countries for the purpose of teaching [6]. However these technologies have not been used for the right reasons, but merely use for entertaining students or even used due to pressure from administrative systems [7]. The technology is more than just being used to upload contents/material but should be well designed to serve as an orderly platform that can facilitate and increase learning experience and become an asset to the educational system [8]. The multimedia content alone, however, does not necessarily result in significant positive learning performance and satisfaction; but in conjunction with a well-structured e-learning environment that will serve as a self-explanatory learning support to the users and enhance their learning experiences.

With multimedia content such as audio-visual presentation in a learning environment will be able to reduce space and time spent for learning. The availability of multimedia content served as a supportive tool for better understanding because of repeated and different format of viewing of the content. Students will be able to review in-depth knowledge of the course at hand. E-learning platform *gives students opportunity to study at any time, at school or at home. It also allows rich academic content to be made available, enable students' exploration and performance improvement.*

The key to an effective e-learning implementation does not depend on just providing multimedia content. Apart from providing beautiful interactions, the content must be presented in such a way that the students or learners are adequately engaged. This will make learning become easy and teachers and students' interaction and learning can also take place at anytime and anywhere, a clear departure from the traditional class room method of interaction and learning.

In several industries, multimedia technology has become an integral part of the daily operational routines and it is creating positive impact [9]. Although the full benefits of multimedia

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in different sectors of the economy and social life is yet to be harnessed even though areas where it has been applied had experienced enormous benefits. [10] reported the yearly demand and increase of video content on the Internet. With the growth in population and the adoption of e-learning in the educational sector, the need for multimedia content will continue to increase.

II. RELATED WORK

Multimedia content on an e-learning platform enable students to learn basic self-exploration skills through practices. The students are able to develop problem solving skills as they try to understand the abstract concepts. E-learning provides connection between people in the remote, or semi-urban and the urban. It enhances interactions and mutual relationship between the teachers and the students irrespective of their location. It also facilitates corporative and individual learning. Teachers and students are able to collaborate and share ideas for better experience.

[5] describes how they used multimedia technology to solve real life problems through simulation. The World Wide Web provides capabilities for delivering interactive multimedia content to students and enable educators to build virtual laboratories for students to increase their learning experience [11]. The combination of multimedia content such as text, graphics, audio, video or animation in a learning material can create a learning environment that is attractive and encourage students', stimulate their senses in the learning process and enhance a variety of student's learning styles [12]. It will also enable the students to build mental models of the audio and visual presentations and effective learning can take place.

The application of computers in the learning process enhances class room teaching. Students' learning senses are stimulated; the effect is higher with the visual senses. In a college level nutritional course, [13] found that there was significant improvement in students' performance as a result of supplementing traditional lectures with on-line tutorials and quizzes. [14] conducted a study using multimedia instruction in college-level political science course with three different study groups. He conducted lectures supplemented with traditional discussion groups (Control group). The second group used statistical and tutorial software (Single Media group), while the third group used hypermedia and videodisc presentations (Multimedia group). He carry out an assessment of attitudes and cognitive learning in all three groups. The study concluded that there was no significant differences in cognitive learning among the groups. It was also discovered that there was positive learning attitudes among the participants in the multimedia group.

[15] designed and conducted a study with a web-based tutorial for teaching spirometry on the Internet. The participants consisted of medical students, interns, and senior hospital staff. [15] found that there was significant improvement in the knowledge base and spirometry interpretation among the participants. Many distance learning educational programmes have adopted web-based learning into their curriculum. With broadband Internet access and user-friendly multimedia development tools, e-learning software are likely to be on the increase. This will enable

delivery of rich multimedia content to large population of students across different geographical regions.

Multimedia also create environment that supports the form of exploration and activities required to enhance learning abstract approaches in real life situations [16]. Multimedia is a technology that supports the incorporation of online modules that enable learners to apply abstract experience into real life context. Multimedia improves the learning process because it gives the learners control over the delivery of information and interactivity. Multiple presentation of the same information in different formats is possible and this provides the learners a realistic environment with several perspectives and roles [17]. Proper application of multimedia in the learning process can enhance psychomotor development and strengthen visual processes in the users [5]. With multitude of learning presentation in multimedia environment, users' cognition and psychology can be broadened, and inferiority barriers eliminated. It is a platform where users' demonstration and feedback response is possible.

Web-based multimedia technology has been identified as a viable technology for teaching and learning [18]. It has potentials to convey flexible and enduring education to learners across different regions and cultures. This is why its acceptance cuts across different cultures. Although technology comes with its challenges such as over dependent on multimedia could cause the teachers to neglect their roles as facilitators, consultants and evaluators [19]. Although multimedia as an educational tool will deliver qualitative learning, enhance learning attitudes and improve students' cognitive as they interact with the multimedia content.

III. RESEARCH METHOD

The study was conducted through the application of three main processes that include requirement gathering, prototype development and user evaluation. During this processes, quantitative and qualitative data were collected. The requirement gathering process involved interaction with potential users of the application. At this stage, students of the University of Calabar were interviewed and questionnaires were also distributed for requirement data. We identified a class as the user group for the study and courses offered by these students were identified as well as interaction elements and functions that are preferred and needed to be included in that application. We also studied similar applications online in order to find out the type of data and information that can be included to enhance the use of the application. Interaction elements such as icons, symbols and features that were needed to be included in the application were also identified. Other forms of interactions such as skype, discussion forum, chat room and short message service were also used included. The development of the application prototype was carried out iteratively with the involvement of the target users. A pilot test was conducted and then followed with the evaluation of the application with the students. During the design evaluation, the participants used the application during school hours and outside school hours to interact with their classmates and instructors.

IV. RESULTS AND DISCUSSION

This study was conducted to enable students interact and learn with multimedia content and improve their learning experience. It is also to enable the learners to learn at any time during and after classroom period. In the study, we looked at multimedia content in e-learning environment as a mean to enhance the students' experience, self-examination and positive engagement. The evaluation was performed by students in the university and their teachers/instructors using for selected courses that they offered. Sixty (60) of the students took part in the evaluation process. They used the application at different times and interacted with themselves as well as their instructors. They used text and audio materials online, conducted chat and discussions sessions with one another and posted questions to their instructors. Download reading materials to read at their own convenience. The skype feature in the application enable the participants to make calls and chat, have video conference with the instructors and other students. The study was conducted during the students' academic semester.

A. The Application Screenshots

The e-learning application was developed through an iterative process. At each stage of development the potential users identified for the study where asked to assess the prototype and make their suggestions. The users made valuable contributions that were used to enhance the application with acceptable features and functions. The screenshots of the application interfaces are presented next.

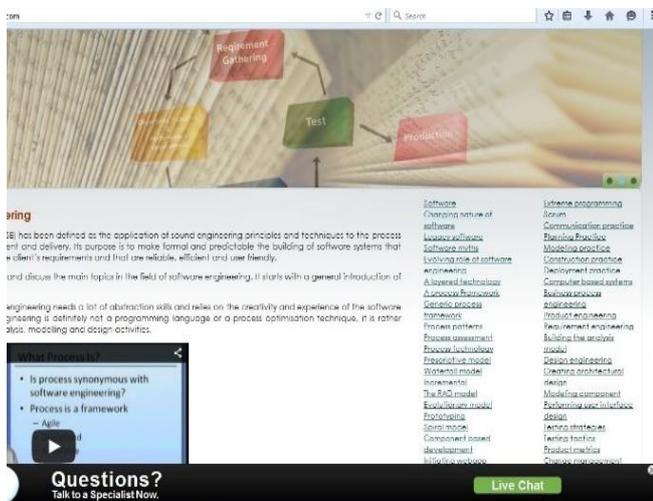


Fig. 1. The home page interface

The home page interface (fig. 1) enable the users to navigate through the entire application. They could stream videos, chat with the teacher/instructor or access the online content. The e-learning application allows the students to learn through audio-visual presentations. The home interface allow the user to navigate easily to choose among the topics that are listed on the platform.

The users' collaboration interface (fig. 2) provides a forum for students to initiate and engage themselves on a discussion among themselves. It allows the users to ask questions, suggest a topic and discuss with their peers during school hours and outside school hours. The users can also respond to discussions through emails.

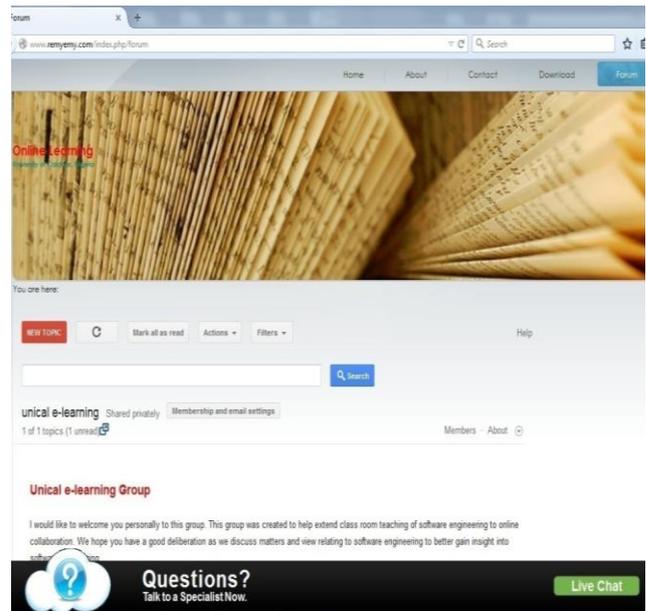


Fig. 2. Users' collaboration interface

Fig. 3 present an interface that allows the user to have live chat with the teacher/instructor outside class room hours. The students and the instructor carry out discussions on topics or issues the students may need further clarification. A skype feature was included for the users to initiate calls to the instructor, have group calls for conference discussions and have better experience during the learning process.



Fig. 3. The chat interface.

B. Pilot test

During the pilot test, 15 students' were randomly selected to use the prototype application. The students were asked to use some features of the application. These include streaming of videos, conduct a group discussion on a given time and on a selected topic while the instructor served as the moderator.

They were also asked to and access the online contents .These activities were performed by the participants while we monitored the processes for possible problems that may arise in the course of the interactions. Few problems were encountered by the participants such as poor performance in the video streaming process, wrong posting of messages and few other challenges. These issues were subsequently handled and the application was enhanced to accommodate the changes. The application was further assessed for errors and functionalities to ensure that the application was performing according to the objectives of its design. This was done using the Intranet facility in the department.

C. User Evaluation

The multimedia e-learning platform was hosted and made visible for users on the Internet and then evaluation participants were given access to the system for evaluation. After the hosting, sixty (60) students were selected and asked to use the application at any time of the day for a period of four weeks. The users provided feedbacks during the discussion sessions as they interacted with the application. In carrying out the study, the students' were asked to use the platform and study a selected course that is offered during the semester. The participants carried out this task by reading materials related to the course online, watching of video presentations, reading of text and viewing images of the same course materials. After this session, the participants then join the discussion forum in the application and responded to the topics under discussion, respond to the queries on blog page, and interact with the teacher/instructor and peers using the chat tool in the application. During the discussion sessions, the rate of activities completion was very high, students' showed knowledge gained during the interactions with the application. At the end of the study period, online interviews were conducted with the participants. Questionnaires were also used to gather evaluation data.

D. Study Results

This study was conducted to determine if multimedia can improve students' learning experience and enhance their performances. We observed that as students learned whenever they choose and carry out discussions on the subject or topic with their instructors and peers online, the many distractions the get as a result of social media are reduced. Quantitative and qualitative analysis were carried out to reveal significant learning outcome. In the first part, the study was formalized into four of research questions. The questions were positively rated likert-scale questions.

The first question (Q1) focus on finding out whether multimedia content for e-learning can enhance students' self-exploration and collaboration. The fundamental underlying question is whether the application of multimedia content for e-learning can improve learning experience and self-examination.

The second question (Q2) seeks to find out whether the mixture of e-learning content such as colours, text, images, videos and sound during learning do help to impact students' psychology and behavior positively among others. It is important to understand if the students after using these contents for learning will improve their attitudes and interest to learning.

The third question (Q3) focus on finding out if the use of multimedia for learning can have a positive impact on students' performance. Apart from the students assessing themselves personally, the interactions on the discussion forum and group chat also reveals answers to this question.

The fourth question (Q4) evaluates students' assessment of e-learning whether it serve as a strong support for class room teaching or not. The emphasis is whether e-learning can be used alone effectively without the students having to participate in class room teaching and learning or it is only providing support to class room teaching and learning.

E. Data Analysis

Table I presents the participants response to Q1. The results shows that when students learn using multimedia content in e-learning, it will improve self-exploration and learning collaboration. In table I, 40% (24) of the respondent strongly agreed that it has enhance their learning ability and understanding of the subject they studied using multimedia content. The level of interaction with their peers during the study improved. They agreed that it was easier for them to reach out to other students and carry out discussions on the course materials. The students were able to answer questions better. A chi-square statistical analysis was performed on the data collected (see table I). With $df = 3$, $\alpha = 0.05$, and $r = .352$, the calculated value of 5.38 was found to be higher than the $r = 1.635$ (table II). The result shows that e-learning with multimedia content can enhance self-exploration and collaboration among the students.

Degree of freedom	Level of significance	Calculated value	Table Value
3	0.05	5.38	0.352

Table I. E-learning enhance self-exploration

Scale	Frequency	Percentage (%)
Strongly greed	24	40
Agreed	32	53.3
Disagreed	0	0.0
Strongly Disagreed	4	6.7
Total	60	100

Table II. The calculated value

Table III presents the response to question 2 (Q2). The results shows that Multimedia content can improve students' learning psychology. The students' behavior and attitudes towards their study did improved. The participants feel that when they used multimedia content for studying, their interest to their study was enhanced. This means they had a better understanding of the study materials and it helped to improve students' mental ability and emotional balance. 50% of the participants strongly agreed that when they used multimedia content to study their course materials, it helped to boost their learning psychology, mental alertness and the level of understanding of what they studied. 45% of the respondents also agreed to this assertion, while 5% of the participants disagreed that multimedia content did improved their learning psychology.

Scale	Frequency	Percentage (%)
Strongly Agreed	30	50
Agreed	27	45
Disagreed	3	5
Strongly Disagreed	0	0
Total	60	100

Table III: Multimedia improve students' learning psychology

Table IV presents the participants response to question 3 (Q3). Multimedia content used for e-learning improves students' performance. During the study, instructors and students interacted using the chat and skype features in the platform. The students were asked questions from the study materials. From table IV, 50% of the participants strongly agreed that the improved performance they experienced was as a result of the different content they used in studying on the e-learning platform. They had gained knowledge better as they continued to use multimedia content. Also, 29% agreed that the use of the different content improved their understanding of the subjects and boosted their performance.

Scale	Frequency	Percentage (%)
Strongly Agreed	30	50
Agreed	29	48.3
Disagreed	1	1.7
Strongly Disagreed	0	0.0
Total	60	100

Table IV: Multimedia content improve student's performance

Table V presents the participants response to question 4 (Q4). The results show that e-learning provides a platform for supporting class room teaching and learning. It enable the students to interact with the instructors, class mates and study materials outside of the classroom. E-learning made the learning process continuous. It creates better understanding and enhances students' performance. Table V shows that 50% of the participants strongly agree that the e-learning process increased their learning experience by providing out of class room experience and supported what they learned in the classroom. While 41% of the participants also see the e-learning platform as a good complement to the classroom experience. Interviews conducted with the participants on the application chat forum revealed that, the participants agreed that they were able to continue to study the lecture materials and had discussions with their peers after the classroom periods. The process had also helped to enhance their understanding.

Scale	Frequency	Percentage (%)
Strongly Agreed	30	50
Agreed	25	41.7
Disagreed	3	5
Strongly Disagreed	2	3.3
Total	60	100

Table V: E-learning support classroom teaching

Chi-square statistical analysis was carried out on the quantitative data collected from the study participants. The participants were given a test with a set of questions to answer

before and after using the e-learning platform. The test was carried out to determine if the use of multimedia content for study can enhance students' performance. Each question required the participants to give brief explanation based on their understanding of the different areas in the study materials. The students were then graded using percentage score. Table VI and VII presents the chi-square analysis for the data that was derived based on the grading.

Table VI shows the analysis based on the outcome of the test and for generating the calculated value for the test result. The calculated value is used to determine if multimedia content is effective in learning. The analysis was performed in order to assess the level of knowledge and experience of the participants after using the multimedia content. That is, if there was any improvement on their performance after using the e-learning multimedia content for learning.

Cell	O	E	O-E	(O-E)*2	(O-E)*2/E
1	35	31.7	3.3	10.9	0.34
2	25	27	-2	4	0.15
3	0	1.3	1.3	1.69	1.3
4	0	0	0	0	0
5	30	31.7	1.7	2.89	0.09
6	27	27	0	0	0.00
7	3	1.3	1.7	2.89	2.22
8	0	0	0	0	0
9	30	31.7	-1.7	2.89	0.09
10	29	27	2	4	0.15
11	1	1.3	-0.3	0.09	0.07
12	0	0	0	0	0
Total					4.41

Table VI: Cross tabulation of test outcome

Table VII shows the degree of freedom and the level of significance used to find out the calculated value. With $df = 6$, $\alpha = 0.05$, and $r = 1.635$, the calculated value of 4.41 was found to be higher than the $r = 1.635$. The result show that multimedia content in e-learning enhances students' learning experience, self-exploration and better performance. This also indicates that using multimedia content in learning environment would trigger student' ability for co-fact finders, self-discovery and problem solving.

Degree of freedom	Level of significance	Calculated value	Table Value
6	0.05	4.41	1.635

Table VII: The calculated value

Previous interaction and assessment of the students through the traditional class room approach did not yield the same or better performance as compared to the results obtained after the use of the e-learning platform. Some of the students complained of difficulty in understanding the course material. This could be as a result of the single format presentation (text only) of the study materials and limited means of interaction with other students and teachers/instructors outside the school hours.

Although different factors influence students' performance, during interviews conducted with the participants at the end of the test, they said the facilities provided in the e-learning

platform positively influenced the level of understanding of the study materials and hence the level of performance. They also said if other study materials are also presented in multimedia format and made available on the e-learning platform, it will also enhance understanding and better exploration of the courses. And eventually improve their performance.

V. DISCUSSION

E-learning is a good tool for learning. It can be used to enhance learning experience outside the classroom environment. Students can have access to lecture materials or a virtual classroom at their convenience. Multimedia content in e-learning provides a variety of learning content that allows students to explore their lecture material in different perspective. This enhances self-exploration and learning experience. E-learning also serve as a learning support to classroom teaching and has shown that it has the potential to improve students' performance. This is because face to face communication still remains the best form of exchanging knowledge. Further study will be conducted for a longer time and to set up two separate experiments to explore other dimensions of multimedia content influence on learning outcome. With the growing trend in the usage and influence of social media on the younger people, creating an e-learning platform that also enable discussions, chats, and forums can be very useful academically. The inclusion of the chat facility in the e-learning platform did encouraged the participants to interact with each other and the instructors academically. They could ask questions and seek for clarity, which ordinary in a normal class room the questions would not have been asked. It also encourage participation and enhanced learning. The study has shown that the exciting features of the platform were the chat and forum facilities provided. They were used for asking and answering questions and discussion of study materials. Apart from using these facilities for academic discussions they were also used for social interactions. It was also revealed that the e-learning platform also encouraged positive interactions among students and with the teachers/instructors. Multimedia content and technology has the potential to improve learning experience. It exposes the learners to technology and bring fulfilment as they learn. E-learning has the potential to enhance students' collaboration and self-exploration.

VI. CONCLUSION

The combination of different format of learning materials in an e-learning platform can create audio-visual presentations that will not only attract students and stimulate students' senses in the learning process, but also treat a variety of students' learning styles (Giam, 2000). Multimedia content in learning environment still have little implementation support other than verbal support especially in developing countries. For the full realization of this technology, various challenges hindering the full implementation must be addressed. Awareness of this technology has to be given adequate attention and priority especially in the educational sector. The e-learning application designed for this study will help the students to learn at their convenience either in school or outside the school environment. Multimedia content for learning also boost students' mental ability. Teacher – student participation and interaction is encouraged. The e-learning

platform was designed considering the environment of use and based on the students' needs. During the study it was found that, it was easier for the students to interact with one another as a study group. Some of the students who in a normal class room setting find it difficult to ask questions were able to do so on the e-learning platform. The students were able to carry on study using the multimedia contents in the e-learning platform. The students were able to use the e-learning system to learn software engineering by streaming videos, call and chat with one another and with the instructors. The use of multimedia content significantly improved students' understanding and performance.

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