THE IMPACT OF EMBEDDED MULTIMEDIA VIDEO LEARNING OF BUILDING CONSTRUCTION PRACTICE ON CONSTRUCTION STUDENTS

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Abstract

Building construction practice involves the process of producing buildings. Over the years, students have reported difficulties grasping the concept because it goes beyond theory. The visual aspect of the course makes the understanding and practice of the course worthwhile for construction students. As the saying goes, seeing is believing. Various instructional designs such as frequent site visits, construction clip arts, workshop practice have been instituted to ease the burden of understanding the course. In this vein, the study aims to assess the impact of embedded multimedia video learning of building construction practice on construction students. The study is a quantitative one through the use of questionnaires. A random sampling design was used for the study. The respondents were building technology students from year two to year five offering the course in a Private tertiary institution in Nigeria. The result revealed that the use of embedded multimedia video learning of building construction practice increased the memory of the course and encouraged class discussion. The study revealed that the use of a maximum 10 minutes instructional video on specific building construction topics were most effective. The major challenge identified in the use of video learning was the frequent power outage making it difficult either to use or complete its use. In conclusion, the use of embedded multimedia video learning should be encouraged at all levels. It was recommended that smart boards multimedia connected to alternative power sources be made available for all building construction practice classes, although this requires sufficient funding. Also, video cameras should be mounted on local construction sites to capture valuable construction activities and made available for academic purposes.

Keywords: Multimedia, video, learning difficulties, construction, smart boards, students.

1 INTRODUCTION

The book, dictionary of Architecture and Construction, [1] defined building construction as the fabrication and erection of a building by assembling or combining building components, subsystems, or systems. It is a systematic process that involves the production of buildings either for commercial, educational, private, religious or social purposes. The concept is as old as man. [2, 3] explained that buildings have transmuted from man's early caves to skyscrapers and most recently to intelligent and smart buildings. These products have provided shelter for which man has survived, providing one of the very essential needs of man. The building construction practice is not static, rather dynamic, therefore, man must adapt constantly to its growing demands.

Building construction as a practice can be learned either formally or informally. The learning process culminates into a profession, whereby there are many professionals that make up the built environment. These professionals such as architects, builders, quantity surveyors, engineers have passed through formal trainings from tertiary institutions and informal trainings from industrial work experiences before been engaged to produce buildings in the three major stages of conception/design phase, construction phase and operation or use phase as identified by [4].

Although, the building industry has persistently been harassed with different challenges among which are: sub-standard services rendered by impostors and uncertified professionals, time and cost overruns, use of substandard building materials, high rate of construction site accidents, lack of skilled labour and building collapse. The benefits of the sector cannot be overemphasized. The importance of the building construction practice can be felt in all strata of the Nigerian hemisphere. [2] noted that there is massive demand for buildings across all sectors of the economy. [5, 6, 7] have largely reported on the housing deficit that exist in the nation, thereby creating a need for efficient and effective building construction practice including quality construction professionals.

Building construction practice is in no way an abstract course, as the products must be seen. And therefore, the eyes, ears and the brain play a major role in acquiring every knowledge required in practicing the course. In tackling the visual process, various instructional designs such as frequent site visits, construction clip arts, workshop practice, 2D and 3D architectural drawings and sketches have been instituted to ease the burden of understanding the course. [8] noted that Multimedia technology has been exploited often for improving teaching and learning. According to [9] these multimedia use in construction are called construction information and are increasingly being used as a source of information in the study and control of construction practices providing information concerning the construction methods used, progress, damage, and the condition of the construction site. This paper aims to assess the impact of embedded multimedia video learning of building construction practice on construction students. The following objective would act as a guide for the study;

- To assess the impact of embedded multimedia video learning of building construction practice on construction students.

- To examine the length of embedded multimedia video that is most effective for building construction practice learning.

- To examine the challenges in the use of embedded multimedia video learning.

2   REVIEW OF RELATED LITERATURE

[10] described learning as the acquisition of knowledge and skills which is made possible through a systematic interaction between teachers and learners. In this light, [11] expressed optimism with the new media brought about by the development of ICT. ([10] opined that the use of multimedia teaching materials and the Internet have brought about the concept Modern teaching. Modern teaching as in the formal use of web-based learning, videoconference systems, social software, e-lecture etc. [12] explained that this form of teaching as engendered flexibility in learning experiences, and potentially de-tethering learning from the bricks and mortar university classroom.

Today's children are growing up surrounded by television and video. [13, 14] described these children as the Net Generation, those individuals born between the early 1990s and early 2000s. The first generation born into the digital revolution in the pervasive use of the internet, cell phones, e-mail, video games and social networking tools. According to [15], children under six spend an average of two hours a day with screen media, more than twice the amount of time they spend being read to or reading. Although, the concept of television and videos in classrooms are not new. [16] noted that the concept have been promoted to classroom instruction since 1950. [17] stated that videos which is a combination of images and sound, creates a powerful medium for explanation of concepts while instructing learners with content that provides multiple senses. This makes the explanation of abstract concepts and processes easier through visualization [17, 18]. Video as a change instrument in the classroom has undertaken a unique cycle of adoption over time [19]. The evolution of videos over the decades ranged from television films in the 70s to video tapes in the 80s, Two-way videoconferencing, camcorders and video CDs in the 90s and DVDs, streaming videos, the popularly youtube, and camera-enabled smartphones in the new millennium [20].

According to [8] integration of video clips in teaching materials has recently attracted more attention in academic research. The principles for multimedia learning are based on the theory of limited cognitive capacities [21]. Whereby less load is applied on the cognitive capacities during knowledge acquisition. The concept of multimedia learning therefore is to tap the full potential of the working memory i.e. the visual and auditory processing by addressing both systems [21, 22]. A combination of different presentation leads to better learning outcomes [21, 23]. Processing the information is performed in two channels as shown in Fig 1 after receiving the auditory and visual information that appears in the working memory as verbal and pictorial information models [8].

MULTIMEDIA PRESENTATION | SENSOR MEMORY | WORKING MEMORY | LONG TERM MEMORY

Words → Ears
Pictures → Eyes

selecting words
selecting images

Word Sound Base — organizing words → Verbal Mental Model
Visual Image Base — organizing images → Pictorial Mental Model
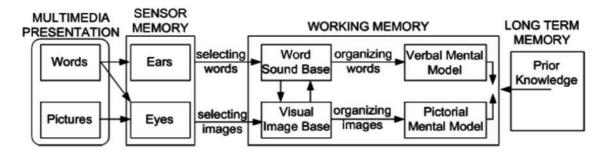
Prior Knowledge

Figure 1. The cognitive theory of multimedia learning [21].

Different researchers have reported on the positive impact of using videos in the learning process. [8] stated that the effects of video clip integration into multimedia presentation can increase student engagement, increase student activity, increase efficiency of the teaching process and increase student's attention on the topic of the lecture. [24] noted that it may also increase the efficiency of the self-learning process. [25] explained that design of instructional multimedia can improve learners' comprehension in technology based environment. [26] adjudged that video learning is capable of engaging the viewer's attention. [27] opined that there is a positive effect upon students' perception regarding the enhancement of their learning motivation. [10] stated that video based materials boost student creativity, cooperation and motivate students to create stronger memory and retention. [28] reasoned that multimedia learning can provide guidance for the learner. It also allows students to take control of their own viewing experiences by pausing and replaying as needed for better understanding of the material [12, 29]. [30] argued that videos can speed up the learning process and add interactivity. In more cognitive terms, video supports students' various learning styles and intelligences [31]. Additionally, [32] posited that multimedia content can increase memory, comprehension, understanding, and deeper learning better than auditory or visual materials alone. [33] stated that the combination of effective teaching and SMART Board technology can maintain high levels of student engagement throughout a multi-component lesson. In an experiment by [34], the experimental group scored significantly higher on a knowledge retention test conducted after four weeks of the intervention which showed that the added media contributed to the retention of knowledge. [35] discovered that the use of YouTube videos increased student engagement, critical awareness and facilitated deep learning. Apart from that, YouTube videos is also used to illustrate theoretical content, involve students, inspire innovative teaching methods, stimulate student discussions and create a learning community [36]. [37] noted that video clips increased study habits and positive attitude towards the course. [38] noted that videos attract students' attention, enhance problem solving and critical thinking skills, prepare individual for real life setting (workplace), increase student engagement, increased feedback.

An important issue in using multimedia leaning is establishing a methodology of embedding video clips in multimedia teaching material in order to improve the learning process [37]. The selection of appropriate video clips and methodology for their display within the teaching materials represents an important issue for curriculum design, leading to positive learning outcomes [39]). [27] stated that durations of videos and methodologies of displaying them influence the effectiveness of learning and student satisfaction. In a study, [40] used short videos to enhance student satisfaction and motivation for an online introductory course in computer science/mathematics and achieved a significantly higher percentage of students' involvement including increase in average grades of the students. [31] explained that the teacher has to decide how he/she wants to use video clips, where and when to embed them into multimedia learning material. Previous research from [41, 42] described the effectiveness of videos embedded in multimedia teaching materials and their influence on the improvement of teaching. [12, 30, 43] advised on keeping the embedded multimedia videos short and focused by breaking up longer content into short, standalone videos and presenting the most important points toward the beginning. In that getting to the point quickly is crucial. Also, [34, 44, 45] stated that the embedded multimedia videos should predominantly be interactive in order to be productive and effective.

3   METHODOLOGY

The study is a quantitative one through the use of questionnaires. The study is centered on students' perception. [46] argued that students' perceptions studies are meant to provide significant source of information about students' experience from their own view. Therefore it is necessary to assess student perspective on their various course of study to form control tools that can make teaching and learning effective. A random sampling design was used for the study. The respondents were building technology students from year two to year five offering the course in a Private tertiary institution in Nigeria making a total of 112 building technology students. For the study, using a confidence interval of 5% and confidence level of 95% a total of 87 building technology students was calculated for the sample size. Out of the 87 questionnaires administered, 76 questionnaires were returned and used for the study. The results were analyzed using SPSS 21.0 and presented in mean score and percentages. In the course of the academic session, building construction practice videos were shown on the SMART boards via USB flash drives connected to them to the students and the video clips were obtained from the internet on sites such as Youtube, break.com, vimeo.com, learnerstv.com, understandconstruction.com, shutterstock.com etc. These video clips were used as supplementary educational materials in the teaching.

4   RESULT AND DISCUSSION

The result and discussion as obtained from the distributed questionnaires are presented under the following headings;

4.1   Impact of embedded multimedia video learning

Objective one of the study assessed the impact of embedded multimedia video learning of building construction practice on construction students. Table 1 showed the impact of embedded multimedia video learning of building construction practice. The result revealed that embedding multimedia videos in building construction practice learning increased the memory of the course having a mean score (MS) of 4.77 and ranked 1st, followed by encourage class discussion ranking 2nd with mean score (MS) of 4.69 and Attract students' attention on the topic being taught ranked 3rd with mean score (MS) of 4.05.

Table 1. Impact of embedded multimedia video learning

Impact	Mean Score	Ranking Index
Increased the memory of the course	4.77	1st
Encourage class discussion	4.69	2nd
Attract students' attention on the topic being taught	4.05	3rd
Increased positive attitude to course	4.01	4th
Increases students' engagement	4.01	4th
Increased interactive behavior	3.83	6th
Increased feedback between students and teachers	3.76	7th
Improved understanding of the course	3.74	8th
Expatiates theoretical concepts of the course	3.59	9th
Inspires innovation and motivation	3.30	10th
Lecture materials available in soft copy	3.28	11th
Enhance problem solving and critical thinking skills	3.18	12th
Prepares for real life work setting	3.17	13th
Increased flexibility in learning experience	3.12	14th
Increased study habits	3.08	15th
Increase in efficiency of the self-learning process	2.60	16th
Provide guidance of the course	2.51	17th
Higher grades in course	2.46	18th

Essentially, the positive impact of videos on the working memory cannot be overemphasized. The result of the study is supported by [10] stating that video based materials creates stronger memory and retention by instilling information in the minds of the students. [32] also noted that the multimedia content of video clips increases memory. In the study by [34], students recorded remembering the multimedia even after four weeks of the experiment. Although, [34] noted that the way the multimedia videos are integrated in the lecture ensures student learning, in that it must be interactive. This approach according to [38] is the constructivist approach to learning which suggests that when students actively participated in the learning activities, they will get engaged and thus, develop the motivation to learn further.

4.2 Effective length of embedded multimedia video learning

The methodology of embedding the multimedia video is crucial. Many researchers have reported on the effectiveness of a short clip that focused on the point that is been tried to convey. This section identifies the effective length or duration of the embedded multimedia video used for the learning of building construction practice. Table 2 showed the effective length of embedded multimedia video and the result revealed that a maximum of ten (10) minutes was identified by more than half of the respondents as most effective showing 39 (51.3%) while maximum of five (5) minutes ranked 2nd with 15 (19.7%) and maximum duration of two (2) minutes had 14 (18.4%). [10] emphasized that video clips don't have to be long, but rather short to aid comprehension. [47] defined short video lectures as a short theory video mostly less than 15 minutes. The result revealed a maximum duration of 10 minutes which can still be termed short, able to captivate the attention of the students. This is supported by [48], who suggested that 10-15 minute clips are most effective, as they do not overtax children's concentration and allow time for focused discussion about the material.

Table 2. Effective length of embedded multimedia video learning

Duration	Frequency	Percent (%)	Cumulative Percent	Ranking
Max. 2 minutes	14	18.4	18.4	3rd
Max. 5 minutes	15	19.7	38.1	2nd
Max 10 minutes	39	51.3	89.4	1st
Max. 15 minutes	5	6.6	96	4th
Max. 20 minutes	3	4.0	100	5th
Max. 30 minutes	-	-	-	6th

4.3 Challenges in the use of embedded multimedia video learning.

The use of embedded multimedia video learning via the SMART board technology encountered several challenges in its use. Table 3 showed the challenges in the use of embedded multimedia video learning. The result revealed that frequent power outage ranked 1st with a mean score (MS) of 4.50. Low sound system ranked 2nd with a mean sore (MS) of 4.11 and Rowdy sessions during interaction and Virus attack ranked 3rd with a mean score of 4.02. Although, the challenge of frequent power outage is peculiar to a developing country like Nigeria, [49] observed that it is a major constraint to the use of ICT by professionals. The [50] stated that the electricity in Nigeria is unreliable and therefore, companies are forced to procure and run their own power generating facilities leading to high production costs. The situation can be bettered by reduction in corruption in the power sector and sourcing for alternative sustainable energy.

Table 3. Challenges in the use of embedded multimedia video learning.

Challenges	Mean Score	Ranking Index
Frequent power outage	4.50	1st
Low sound system	4.11	2nd
Rowdy sessions during interaction	4.02	3rd
Virus attack	4.02	3rd
Faulty sockets	3.79	5th
Poor lighting and visibility	3.76	6th
Inability to source for new videos on specific topics	3.33	7th
Availability of SMART boards	3.29	8th
Short duration of class	3.20	9th
Loss of concentration	3.17	10th
Students' non-attendance of lecture	2.10	11th
Lack of cooperation from students	2.08	12th
Inability to operate SMART board	1.84	13th

5 CONCLUSION AND RECOMMENDATION

From the study, it was observed that huge benefits emanate from the use of embedded multimedia video clips for learning building construction practice. It is vital that the method of integration is strictly adhered to in order to optimize the use of the video clips with other instructional materials in achieving learning objectives. The result from the study revealed that the use of embedded multimedia video learning of building construction practice increased the memory of the course and encouraged class discussion. It is thought that these two parameters mixed together would aid assessment and future use. The study found out that a maximum of 10 minutes building construction process video engendered the students' attention. The major challenge observed from the students' perspective was the frequent power outage which hampered the effective use of the building construction process video clip on the SMART boards. It was observed that whenever there was power outage, the concentration of the students was affected. In conclusion, the use of embedded multimedia video learning should be encouraged at all levels. Teachers should always keep in mind the learning outcomes and surf for building construction video clips that would align with the topics under study. It is important to be strategic in integrating the embedded multimedia video learning with other learning materials assigned for the course. Ensure to use building construction video clips that are short and focused as possible. It was recommended that smart boards multimedia connected to alternative power sources be made available for all building construction practice classes, although this requires sufficient funding. Also, video cameras should be mounted on local construction sites to capture valuable construction activities and made available for academic purposes.

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