



INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES



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To Link this Article: <http://dx.doi.org/10.6007/IJARBSS/v13-i2/16336> DOI:10.6007/IJARBSS/v13-i2/16336

Received: 16 December 2022, **Revised:** 19 January 2023, **Accepted:** 07 February 2023

Published Online: 26 February 2023

In-Text Citation: (Olusola-Fadumiye et al., 2023)

To Cite this Article: Olusola-Fadumiye, T. O., Harun, J. B., & Zakaria, M. A. Z. bin M. (2023). The Efficacy of Authentic-based Multimedia Learning on Students' Performance, Cognitive and Behavioral Engagement Level in Nigerian Higher Institutions. *International Journal of Academic Research in Business and Social Sciences*, 13(2), 1421 – 1438.

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Vol. 13, No. 2, 2023, Pg. 1421 – 1438

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The Efficacy of Authentic-based Multimedia Learning on Students' Performance, Cognitive and Behavioral Engagement Level in Nigerian Higher Institutions

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Abstract

Authentic learning is a programme designed to connect what students learn in school to real-world issues. Getting students actively engaged and challenging their understanding through authentic-based applications multimedia learning is one strategy that could be employed in designing an educational practice to expose students to real-world issues that could improve their cognitive and behavioral engagement. This study aimed to evaluate the effects of authentic-based multimedia learning environment on students' performance, cognitive and behavioral engagement level. Experimental study involving treatment group was conducted on 90 accounting students' year (2) in Ekiti State University, Nigeria, using purposive sampling techniques. The instruments used were questionnaire questions on the cognitive and behavioral engagement level and achievement-test scores (pre-test and posttest questions) on the performance test between the pre-test score ($M=20.44$, $SD=10.19$) and the posttest score ($M=30.49$, $SD=10.56$) in the control group and the pre-test score ($M=16.96$, $SD=7.18$) and the posttest score ($M=74.44$, $SD=12.57$) in the treatment group. The findings showed that the authentic-based multimedia learning strategy had a positive effect on the students' performance and the engagement level. Nevertheless, the results also suggest that the effect of using authentic-based multimedia learning should involve the engagement of students in the real-world learning situations in tackling challenges. The implications of the results shows that authentic-based multimedia learning strategy enhances students' performance, cognitive and behavioral engagement in the learning environment.

Keywords: Cognitive Engagement, Behavioral Engagement, Performance, Authentic-Based Learning, Multimedia.

Introduction

More attention is now being paid to approaches to engage students to optimize learning as opposed to how traditional classroom practices promote little group discussion and

cooperation. High levels of student boredom and disaffection, low academic performance, and high dropout rates in the learning environment have all been addressed by increasing interest in the idea of engagement.

Definition of Student Engagement

According to the previous studies. The term "student engagement" describes how actively students participate in tasks and activities that are relevant to education (Gray & Diloreto, 2016). Although many students participate in school activities effectively during their teaching studies, but some of them have major issues that expressed the students' reactions in the learning environment that has negative effects on their performance. Getie (2020) indicated that such negative effects include frustration, boredom, anxiety which leads to the dropping out of school. In this way, students' emotions are evident during their learning experiences, especially when they are cognizant of their feelings. Prior to now, engagement has mostly centered on the objective of enhancing each student's ability to comprehend how to learn in a competency learning environment in order to become a better student. Delfino (2019) described that students' obligations and responsibilities have been strongly associated with cognitive, behavioral, and emotional engagement, and class-based activity has an influence on students' academic performance.

Types of Engagement

As a result, the engagement notion incorporates a wide variety of multiple strengths and shortcomings in the current structures. So, in line with the idea of student engagement, this study would want to focus on cognitive engagement, behavioral engagement and not on emotional engagement because emotional interaction has been overemphasized in so many articles (Fastrich & Murayama, 2016). Additionally, there isn't much information written about in tertiary academic settings about cognitive and behavioural engagement, which tends to be more generic than the associated constructs. The active participation of the student in social groups, classroom interaction, study at home and at school, and extracurricular activities connected to school are all examples of behavior engagement while cognitive engagement relates to the student's personal involvement in educational activities, (Ginting, 2021) such as self-regulation, metacognition, knowing and the application of study techniques. As a result of the institution's problematic behavior of students' failure to meet their academic goals, the involvement of students in higher education (university) has been identified as a key contributor to the problem of students quitting school (Coronel & Gómez-Hurtado, 2015). However, issues that impede learning have been identified, including the overuse of the media and its inadequacy for delivering information to students, which adds to a lack of awareness on the interest and motivation of the students to study successfully in the educational setting. According to (Costley & Lange, 2017) employing a variety of media to convey information to students during lectures helped them to identify the issue of a lack of media diversity; when two media, such as the auditory and visual, are merged simultaneously, the content is made more useful to the students. Hence, lacking exposure to a variety of media, students failed to recognize the information given to them during the learning process.

Importance of Students' Engagement

In order to engage the students' behavior in the learning environment and changing the way lessons are taught in the classroom so that contextual learning may take place in an authentic learning context. Mostly in globalized classroom, the design and facilitation of authentic

learning is complicated and calls for a certain amount of uncertainty to open up educational approaches to answers like thinking about real-world problems or giving students the opportunity for relevant learning through teamwork (Sanger, 2020). Furthermore, authentic difficulties are more complicated, and students can become more involved with a real scenario (Gillett-Swan, (017).

As a result, students who are given a more realistic learning experience should be able to concentrate on creation and experience with the use of multimedia in order to better comprehend and encourage the construction of authentic learning environment. Based on the current studies, multimedia technologies have a significant impact on student learning by broadening their learning and combination knowledge base (Abdulrahman et al., 2020). As a component of the student's scope of work, Alobaid (2020) regarded multimedia as the various digital technology forms, such as text, videos, motion, and image, into an integrated interactive multi-sensory application or display to transmit a message or data to a person. However, issues can still arise when students are exposed to multimedia that is inappropriate or insufficient for their needs, which makes it difficult to gauge students' motivation and interest in studying in a school learning environment (Lodge et al., 2018).

Definition of Authentic Learning with the Effects on Cognitive and Behavioural Engagement

Since the use of technology in teaching might give better information for the students to get visual, auditory, and sensory experiences, it is imperative that instructors be motivated to adopt multimedia as a new trend in education. Students must thus accomplish activities that would be carried out in the real-world context in order to participate in authentic learning environment. Getting students actively engaged and challenging their understanding through authentic-based applications multimedia learning is one strategy that could be employed in designing an educational practice to expose students to real-world issues that could improve their cognitive and behavioral engagement (Martin & Bolliger, 2018). As a result, the usage of authentic-based learning environments will also strongly enhance students' ability to design the necessary abilities in the actual environment while protecting them from distractions, disillusionment, and difficulties in the learning activities. Titilope & Jamalludin (2021) enumerated that there are concerns and problems that need to be addressed before authentic-based multimedia learning can be implemented using multimedia tools.

This indicates a serious issue that may emerge when students leave school untrained or lacking in knowledge in the information Community for a wealthy and secure life in which they will work and lead if the instructors fail to modify the methodology, instruction, and assessment techniques used for teaching, which can compromise their own future. Thus, Students want important education that is not difficult: they want to interact with things that matter, to solve practical issues, to learn from each other and others in their cultures, to participate in classroom discussions, and to recognize that their studies will have a beneficial influence on the world (Keiler, 2018). In order to provide students with engaging experiences for learning skills, this study demonstrated how researchers incorporated authentic-based multimedia learning.

In addition to authentic-based multimedia learning, components of cognitive and behavioral engagement may be incorporated into the learning environment to improve the abilities of the students. Students' collaboration with instructors and peers in classroom activities and their level of engagement with the coursework have all been correlated (Rajabalee et al., 2020). Conversely, students who are more intellectually involved in the learning process perform better academically than those who are less cognitively engaged. This is based on

the fact that studies have shown that student cognitive engagement is a main determinant of educational advancement and hence helps to improve students' academic performance (Pietarinen et al., 2014). Thus, consider a case in which a teacher has not yet attained a level of competency in classroom management and hence may have an increased cognitive effort as a result of the requirement to actively fix classroom problems while also concentrating on how to execute the lesson plan. Walker & Koralesky (2021) highlighted that cognitive engagement has traditionally been identified by evaluating students' completion of assignments, attendance, participation in extracurricular activities, interactions with instructors, and how motivated they are during class discussions. Mokhtar (2016) asserted that issues of students' interest and attention has not been fully attended to in the learning environment. Thus, the way the teacher teaches now is a result of cognitive growth. i.e., the practise of instructing students using traditional methods in the classroom. Also, in Nigeria's higher institutions, this study area has not received much attention.

Definition of Multimedia with the effects on cognitive and behavioural engagement

As a consequence, the requirement for multimedia has to be incorporated into the institutions' curricula. The incorporation of multimedia in the learning environment has therefore been met with resistance due to evaluative concerns such as technological difficulties, ambiguity, activity coordination, and the need to become proficient in a virtual world (Fedulov, 2005). Though multimedia aids teachers in combining text, visuals, animation, and other media into a comprehensive programme and giving their pupils in-depth information in order to get appropriate learning outcomes to address the challenges, such that disengagement has an adverse impact on students' cognition and academic performance, which contributes to high school dropout. As a result, student engagement is important for implementing deeper learning and requiring more effort from students, both of which increase their chances of succeeding in the classroom. Unlike to behaviorally engaged students who are well-organized towards learning by their efforts and involvement in the classroom learning activities, it is unclear whether behaviorally disengaged students jeopardize their motivation in the classroom without teacher-student interactions (Nguyen et al., 2016). Due to the possibility of engaging in behaviors without also engaging cognitively, behavioral engagement cannot be used as a reliable measure of the accomplishment of tasks requiring higher level learning processes.

Hence, Xie (2021) mentioned that employing generative methods to get students interested in learning can improve students' cognitive and behavioral engagement with instruction that make sure students have solid assistance so they can develop the necessary abilities in the actual world without distractions, limitations, or boredom throughout their learning activities. Additionally, as a consequence of the study, multimedia contexts are seen as meeting the requirements of authentic learning environments. Therefore, there is no ideal technique to increase student engagement in the classroom, but technology teaching methods have shown to do so when combined with successful innovations in learning outcomes. This transforms the conventional style of instruction into a very effective classroom learning strategy. Previous study have revealed that the problems with conventional teaching methods taught in higher education, which emphasize discrete information and activity rather than modern institutions' emphasis on problem-solving and real-world application (Herrington & Oliver, 2000). Also, issues with student involvement with the use of multimedia programmes for instruction include improper guidance for helping them in the classroom. Based on the discussion above, the level of student engagement in

the classroom is a critical factor to take into account. Research on the field of study has started to develop in Nigeria, however few studies have focused much on cognitive and behavioural involvement in learning. There were no studies specifically that used authentic-based multimedia learning as a mediating factor in this connotation. Therefore, this study aims to evaluate the effects of authentic-based multimedia learning environment on students' performance in test, cognitive engagement level and behavioural engagement level. It hypothesizes that several factors need to be taken into account in order to encourage effective and lucrative authentic learning.

This study's theoretical context highlights the significance of integrating authentic-based multimedia learning as an educational strategy in a more relevant and challenge environment. Students will benefit from a better teaching and learning environment as a result, and this will serve as a key strategy for bettering student performance and learning outcomes (Olufunke & Harun, 2022). The next aspects of the study offer a review of related research as well as the methodologies used to investigate the expectations about authentic-based multimedia learning. The method of analysis is also discussed, the findings and their relevance are also examined. As a result, to identify the intended outcome in the framework, a link between the input process and the intervention process is shown in Figure1.

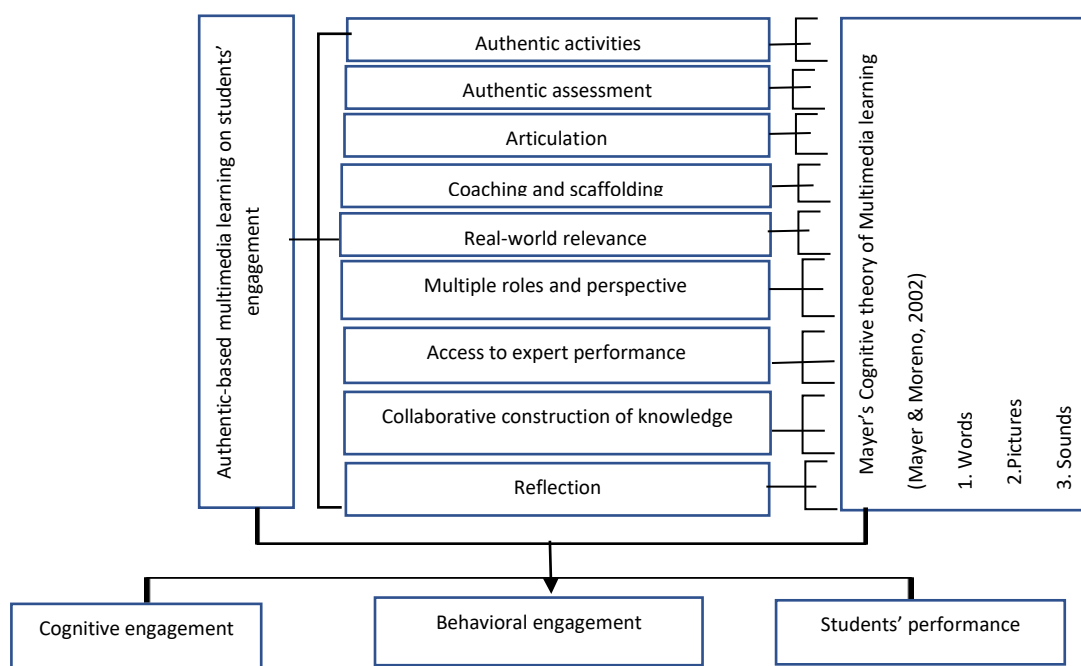


Figure 1: The Framework of authentic-based multimedia learning that enhances students' cognitive engagement and behavioral engagement.

The Design and Development of Authentic-based Multimedia Learning Environment

An interactive learning environment is prioritized in the development to provide students' education significance. By incorporating multimedia components, the interactive components have also been highlighted to provide more visually appealing and powerful presentations. During this stage, the design module concentrated on the content and design, which required the selection of suitable learning activities, real-world assignments, coaching, photos, videos, sounds, and assessments. Consequently, by merging interactive components, it may also create presentations that are more engaging to the students. The authors therefore proceeded on to the design and development phase, which began with the creation

of a storyline which included the creation of the visual design phase, interaction design phase, and information design phase.

The Interaction Design Phase

The front page of this application served as the starting point. To assist students during the authentic-based multimedia learning phases, some characters were used for scenarios in the design page and there is user guide in the front page of the application for direction which is the most crucial part in this programme. There are nine main buttons on this page for the students to navigate from one section to another. The authentic-based multimedia learning process must be completed by students in order to understand the meaning of each phrase.

The Visual Design Phase

Students are asked for their opinions and criticisms on the interface design while it is being created in the early phases. These opinions and criticisms were taken into account during the improvement process to produce the final interface layout that the students found appealing and practical. Throughout the creation of this programme, feedback about the background color, navigation buttons, links, images, and multimedia components were taken into account.

The Information Design Phase

The foundation theory for this research is based on the principle of situated learning theory (Lave & Wenger (1991) which is focused on the characteristics of authentic learning acknowledged by (Herrington & Kervin, 2007). In order to motivate authentic learning in the classroom, it will be helpful for instructors to understand the characteristics of situated learning that emerged from the study and how to employ them in the classroom. As a result, there are actual solutions to which the theory of multimedia learning may be successful on the usage of new instructional technology that will be guided by authentic principles impacting their learning with the model of auditory and visual through which students can learn better (Ibrahim, 2011). When students are involved in real-world challenges and circumstances that encourage them to seek understanding of a wide variety of subject matter being taught in the classroom setting, the capacity to actively engage them and spark their creative thinking has become the primary force behind authentic learning (Darling-Hammond et al., 2020). For that reason, there is a need for techniques to encourage students to become an important part of the learning process as well as to assist them from the factors mitigating against active participation in their course topic to solve problems in the traditional scenarios. The learning environment where authentic-based learning is integrated into multimedia learning, where the developer has provided the activities that engaged the students with the authentic-based learning classroom as opposed to the traditional classroom, is another crucial aspect that needs to be highlighted. Moreover, to convert the conventional classroom

into a multimedia learning environment based on actual content, the author has discovered and chosen the appropriate activities and evaluations, as indicated in fig.2

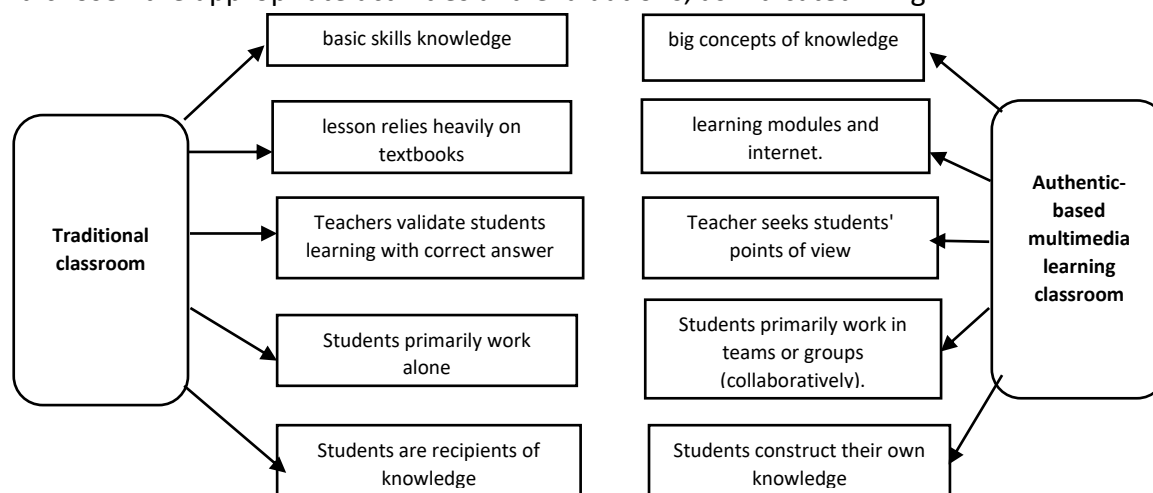


Figure 2: Comparison of traditional classroom with Authentic-based multimedia learning classroom

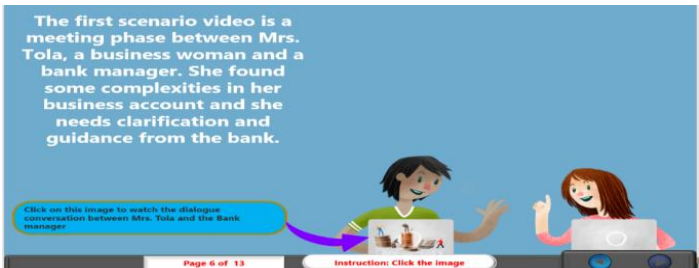
Therefore, the fundamental idea behind authentic learning is that students may be more motivated and engaged in learning when they are exposed to new information and skills rather than when they are only exposed to theory. Instructors are evolving into learning environments that focus on the students learning activities. The development of this learning module based on authentic learning whereby the authors documented assessment findings utilizing Herrington's nine principles of authentic learning as the primary foundation for the framework, and then assessed the learning activity through participant feedback. Therefore, the analysis phase is the first stage of the whole ADDIE methodology and the contents provided including the students' existing experience with problem-solving, are factors that need to be taken into account. The design phase is the second step of this ADDIE paradigm.

This phase is the result of the analytical phase that was completed before. To make learning relevant for students, the development places an emphasis on an interactive learning environment by incorporating multimedia components. The interactive parts have also been highlighted to provide more visually appealing and engaging performances. The authors thus carried on to the design and development stage, where they first created a storyboard before creating the interface, interaction, and content. The preparatory step for creating the developed authentic-based multimedia learning environment by processing the necessary resources is basically what the development phase is after the design phase. The front page of the learning module served as the starting point for interaction design which the students have to go through all the authentic-based multimedia learning phases. In order to create a conducive learning environment that may enhance cognitive engagement and behavioral engagement among students' academic performance, this article will show how authentic-based multimedia learning is designed and developed with the nine elements of authentic learning principles proposed by (Herrington & Oliver, 2000) that can support the learning performance in the multimedia learning environment. The nine elements were presented in their description of ideas by Providing for authentic assessment, authentic activities, authentic contexts, coaching and scaffolding, multiple roles and perspectives, support collaborative construction of knowledge, promote reflection, articulation and enable real-

world relevance.

The features of operation and the navigation structure and all input and points of view were gathered, acknowledged, and used as needed to make changes. For instance, information gained that suggested video would increase the effect of the given features, the author included a media aspect to the authentic-based multimedia learning characteristic, which is guiding the learning activities towards assignments and major tasks in the learning environment. Table 1 shows how the authentic learning principles and multimedia elements were integrated into the authentic-based multimedia learning environment.

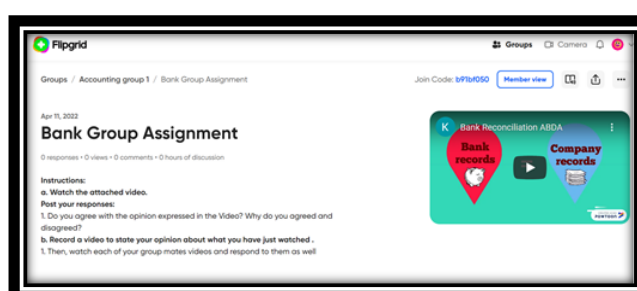
Table 1
Information Design Process

| Principles | Elements | Implementation |
|----------------------|----------|--|
| Authentic activities | Word |  |

Scenario facet for learning activities

Students were allowed to interact with the application and investigate it. Following the scenarios, students reflected on their assignment in the learning exercises. The scenarios made available to students make their learning topics more interesting and fun for them to experience during their tasks. Students learn more effectively when multimedia messages are provided as spoken text.

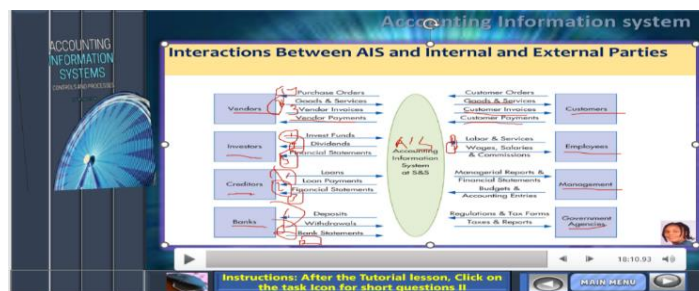
Articulation



Learning task

Students were able to present arguments on the topics that were assigned to them in this learning environment. Additionally, the students were divided into various groups utilizing the Flipgrid tool to articulate their thoughts.

Coaching and Sounds scaffolding



Recorded slide by Instructor

Students are equipped with the information and concepts covered by the instructor in the course material, enabling them to comprehend how to apply those concepts to problems in the real world, whereby instructor transcribed by providing directions to the students to communicate through graphics, sound, and graphs.

Real-world relevance Verbal mode



Scenario problem using real situation

The course contents' graphics are used by the students to build their understanding of the subject, by answering the tasks given within the scenarios to demonstrate the content's applicability in the real world. With the verbal mode illustration, Students are provided with a verbal explanation as well as a multimedia explanation that includes narration and concurrent animation.

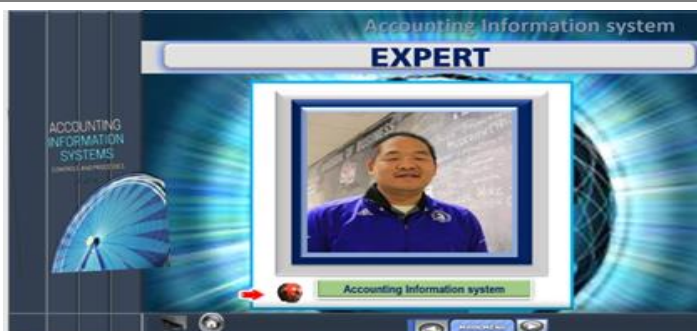
Multiple roles and perspective



Perspective from YouTube

In the classroom, students explore their tasks from several points of view which is done through YouTube and from experts in order to learn more about the problems related to the discussed topics from many perspectives.

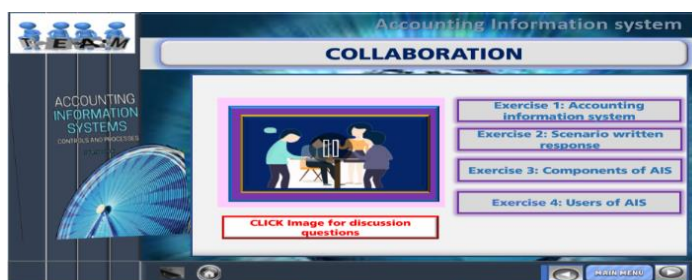
Access to expert performance Pictorial mode



Expert performance

The access to the expert performance and exposing students to different levels of experience, they are given the opportunity to interpret real-life situations as they emerge. They were able to organize selected images into a cohesive pictorial representation as well as pick pertinent words from the supplied text or narration and pertinent graphics to create a coherent verbal representation.

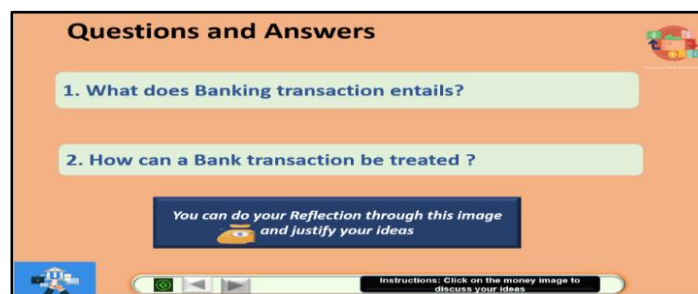
Collaborative construction of knowledge



Collaborative tasks

This made it possible for students to work as a group to develop their own ideas and gain from one another.

Reflection



Students' reflection from the real information, whether is true or false.

To ensure a full understanding of the subject, students share their ideas and suggestions with other students. They also authentically reflect upon and communicate what they have learnt in the classroom.

Research Design

This study was an experimental study involving a treatment group. The main objective of this study was to answer the following research question:

What is the effect of authentic-based multimedia learning environment on students':

- a. performance in test,
- b. cognitive engagement level,
- c. behavioral engagement level.

The learning module was tested with 90 accounting students (year 2) in Ekiti University, Nigeria using purposive sampling. To answer the research question, the instruments used in this study were one set of achievement-test scores (pre and post) to see the level of students' achievement before and after the intervention. The achievement test was developed according to the year 2 accounting syllabus and based on the levels of Revised of Bloom's Taxonomy (Anderson & Krathwohl, 2001) and questionnaire questions was used to measure the cognitive and behavioral engagement level of the students on the basis of the four Likert scale from 1-4.

Results

The research question was addressed in order to evaluate whether there were significant differences between the pre-test and post-test scores, inferential statistics were employed in a quantitative analysis using the Statistical Packages for Social Sciences (SPSS) v27 for Windows programme. Descriptive statistics were utilized to assess students' achievement test results and to determine each students' percentage scores on the pretest and posttest. This demonstrated a significant enhancement on the students' performance, cognitive and behavioral engagement after the intervention. Meanwhile, after utilizing the learning module, the students' cognitive and behavioral level might be regarded to have increased and the responses students gave in response to the tasks they completed during the learning session show how the activities affected the students' performance, cognitive and behavioral engagement level.

A normality test was performed to make sure the data gathered were normal by using the Shapiro-Wilk value. There were two normality tests performed. However, Shapiro-Wilk test statistics will be taken into account in this study to establish the normalcy. Shapiro-Wilk test is employed because it can successfully conduct a normality test on a dataset with less than 2000 components. Table shows the normality test that the alpha value was $p > 0.05$.

Table 2
Normality test

| Tests of Normality | | | | | | |
|--------------------|---------------------------------|----|-------|--------------|----|-------|
| | Kolmogorov-Smirnov ^a | | | Shapiro-Wilk | | |
| | Statistic | df | Sig. | Statistic | df | Sig. |
| Control pretest | 0.140 | 45 | 0.028 | 0.920 | 45 | 0.004 |
| posttest | 0.117 | 45 | 0.139 | 0.946 | 45 | 0.035 |
| Treatment pretest | 0.185 | 45 | 0.001 | 0.913 | 45 | 0.002 |
| posttest | 0.086 | 45 | .200* | 0.951 | 45 | 0.058 |

a. Lilliefors Significance Correction

From Table 2, it was shown that the data collected have a non-normal distribution in the Performance level test, The normality test for the pre-test (0.004) and post-test in the conventional group (0.035) are not normal which denotes that $0.004 < 0.05$ and $0.035 < 0.05$. Also, the normality test for the pre-test (0.002) is not a normal distribution while the post-test in the experimental group (0.058) is a normal distribution because is greater 0.05 which denotes that $0.002 < 0.05$ and $0.058 > 0.05$. Therefore, Mann Whitney u signed rank test was used to test the performance level in non-parametric test.

Table 3
Mann-Whitney U Test on the pretest and posttest of both Groups

| Test Statistics ^a | | |
|------------------------------|----------|----------|
| | Pretest | Posttest |
| Mann-Whitney U | 839.500 | .000 |
| Wilcoxon W | 1874.500 | 1035.000 |
| Z | -1.398 | -8.173 |
| Asymp. Sig. (2-tailed) | .162 | .000 |

a. Grouping Variable: GROUP

From Table 3, it showed that the independent-Samples Mann-Whitney U Test used for the distribution of posttest in the same group was 0.000 level of significance lesser than 0.05 p-value which indicated that the null hypothesis is rejected while the distribution of pretest in the same group was 0.162 greater than the p-value 0.05 which indicated that the null hypothesis is accepted. From this non-parametric test, it has revealed that there was a significant effect on the students' performance level after the intervention (treatment).

Hence, the achievement of the students in the pretest and posttest for their level of performance based on the percentage clearly shows that after utilizing the application for six weeks, all students demonstrated a significant increase in their performance level on the post-test score. From this descriptive analysis, the participants' performance in test in conventional and experimental group were recorded in Table 4 to show the mean and standard deviation values.

Table 4

Mean Score and Standard deviation between control and treatment group on Students' Performance level

| Group | Type of test | N | Min | Max | Mean Percentage % | Std. Deviation |
|-----------|--------------|----|-----|-----|-------------------|----------------|
| Control | Pre-Test | 45 | 8 | 43 | 20.44 | 10.19 |
| | Post-Test | 45 | 10 | 48 | 30.49 | 10.56 |
| Treatment | Pre-Test | 45 | 7 | 32 | 16.96 | 7.18 |
| | Post-Test | 45 | 52 | 94 | 74.44 | 12.57 |

Therefore, table 4 shows the posttest scores are higher than that of the pretest scores for all participants in the experimental group and the comparison of the pretest and posttest results showed that all participants scores had improved in learning in the experimental group. The questionnaire used for the analysis of the test found a significant difference in cognitive level and behavioural engagement level in the mean score ($M=3.21$, $SD =0.68$), ($M=3.19$ $SD =0.67$) as shown in Table 5.

Table 5

Shows the Overall findings on the students' cognitive and behavioural engagement level

| D | Engagement Level | Mean | SD | Scale rate Classification (3.01-4.00) |
|---|-----------------------|------|------|---------------------------------------|
| 1 | Cognitive Engagement | 3.21 | 0.68 | High |
| 2 | Behavioral Engagement | 3.19 | 0.67 | High |
| | Overall | 3.22 | 0.66 | High |

It was revealed in Table 5 that the cognitive engagement level in the mean score was (3.21) and the standard deviation (0.68) were higher than the behavioral engagement level mean score (3.19) and the standard deviation (0.67). Whereby, the overall mean and standard deviation for both cognitive and behavioral engagement were (3.22) and (0.66) which makes a high value in the scale rate mark ranging from 1.00- 2.00 (low), 2.01-3.00 (average) and 3.01-4.00 (high). Therefore, it was indicated by the overall mean (3.22) which falls in the high scale rate that the implementation of authentic-based multimedia learning environment had effect on students' engagements (cognitive and behavioral engagement level).

Findings and Implications

The findings of the experimental study suggest that the use of authentic-based multimedia learning can have a significant positive impact on student motivation, cognitive involvement, and learning performance. It's also important to note that the study suggests that authentic-

based multimedia learning can be particularly effective in addressing issues that may prevent active participation in traditional classroom settings.

The study's findings also highlight the importance of developing and promoting student engagement in higher education institutions. Using authentic-based multimedia learning as a strategy to modify higher education curricula can be an effective way to engage students and enhance their learning experiences. By incorporating authentic-based multimedia learning into curriculum design, higher education institutions can create a more dynamic and interactive learning environment that encourages student participation and engagement. This can ultimately lead to improved student learning outcomes and academic performance.

Overall, the study's findings emphasize the value of incorporating authentic-based multimedia learning into higher education curricula and the potential benefits this approach can have in enhancing student motivation, cognitive involvement, and learning performance.

Conclusion

In conclusion, the findings indicate that using this learning module yielded positive results. This research has gone over in detail how authentic-based multimedia was designed into the learning environment for students' engagement. This module was developed based on the components of the learning environment in order to enhance students' behavioral and cognitive skills. Therefore, in order to foster the optimum students' level engagement in the learning environment, instructors must be more inventive in designing good quality learning strategies to enhance the students' skills. According to the findings, this study proves that the design of the learning module of authentic-based multimedia learning influences the performance of students and enhances their cognitive level for better achievement in the learning environment. However, students' behavioral engagement level is not a static outcome on the use of the learning module but paying attention and demonstrating interest in the learning activities. The study findings could help provide the developed modules on students' engagement for learning courses in Nigeria higher institutions to handle challenges in the real-life situations and to modify the traditional methodologies by providing students with authentic learning approach. Future research needs to look more deeply into the role that learning environments have on students' outcomes in their learning and overall, especially their behavioral engagement with learning strategies in the classroom.

Contribution to Knowledge

The study emphasized the need for further research on the relationship between student engagement and education technology in order to develop and enhance the learning curriculum. By exploring this relationship, educators and researchers can gain a deeper understanding of how technology can be used to engage students' cognitive abilities and facilitate more effective learning outcomes.

Education technology has the potential to revolutionize the way students learn and engage with course material. By incorporating technology into the curriculum in meaningful and effective ways, educators can create more interactive and engaging learning environments that better cater to the needs of students. Further theoretical studies in this area could provide valuable insights into how technology can be used to support student engagement and facilitate deep learning. By providing students with engaging and relevant multimedia

resources, educators can create a more dynamic and interactive learning environment that encourages active participation and deep learning. This, in turn, can lead to improved academic performance and overall student satisfaction. It's encouraging to see research supporting the use of innovative and effective teaching strategies in the classroom.

Overall, the recommendation to explore the relationship between student engagement and education technology is an important one. By continuing to investigate this relationship, educators and researchers can develop more effective teaching strategies and curricula that better cater to the needs of students and promote optimal learning outcomes.

Conflict of Interest

The author declares no conflict of interest regarding the publication of this paper.

Acknowledgement

This work was supported by the Tertiary Education Trust Fund (Tet Fund) of Nigeria and the Department of Vocational and Technical Education, Faculty of Education, Ekiti State University, Ado-Ekiti, Nigeria.

The authors would also like to thank Universiti Teknologi Malaysia (UTM) for the support in making this project possible. Part of this work was supported by the UTM.

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