

UTILIZATION OF E-LEARNING TECHNOLOGY FOR ENHANCING KNOWLEDGE RETENTION AND ASSIMILATION AMONG BUSINESS EDUCATION STUDENTS IN EDO STATE TERTIARY INSTITUTIONS, NIGERIA

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Abstract

This study investigated the utilization of e-learning technology for enhancing knowledge retention and assimilation among business education students in tertiary institutions in Edo State, Nigeria. A descriptive survey research design was adopted. The population comprised 558 final-year business education students, from which a sample of 233 respondents was drawn using the Taro Yamane formula alongside proportional and stratified sampling techniques. Data were collected using a validated questionnaire (UETEKRASAQ) with a reliability coefficient of 0.86. Mean and standard deviation were used to answer research questions, while Analysis of Variance (ANOVA) and independent samples t-test were used to test hypotheses at the 0.05 level of significance. Findings revealed that e-learning technology enhances knowledge retention to a high extent (weighted mean = 2.89), with key indicators such as ease of reviewing materials (mean = 3.23) and improved recall through interactive activities (mean = 2.96). Similarly, e-learning technology was found to enhance students' assimilation skills to a high extent (weighted mean = 2.89), particularly in understanding complex concepts (mean = 3.05) and improving learning through instructional videos (mean = 3.20). The ANOVA result showed a statistically significant difference in knowledge retention based on institutional type, $F(2,224) = 6.661$, $p = 0.002$, leading to the rejection of the null hypothesis. However, the t-test result indicated no significant difference in assimilation based on gender, $t(225) = -1.305$, $p = 0.193$, leading to the retention of the null hypothesis. The study concluded that e-learning technologies significantly improve knowledge retention and assimilation among business education students, although institutional factors influence the extent of effectiveness. It was recommended that tertiary institutions strengthen digital infrastructure and promote capacity building for effective utilization of e-learning technologies.

Keywords: E-learning technology, knowledge retention, assimilation, business education

Introduction

The transformation of educational delivery through digital technologies, internet connectivity, learning management systems, cloud-based academic platforms, and multimedia instructional tools has significantly reshaped teaching and learning processes across higher education institutions. Contemporary tertiary education increasingly depends on technology-driven instructional systems to enhance knowledge dissemination, improve learner engagement, and facilitate flexible access to academic resources. However, the integration of digital learning platforms has also introduced new challenges regarding the effective utilization of these technologies in promoting meaningful learning outcomes among students. Within business education programmes, the utilization of e-learning technology has emerged as a critical pedagogical strategy capable of enhancing students' cognitive development, knowledge retention, and conceptual assimilation. E-learning technology refers to the use of electronic communication devices, internet-based platforms, and multimedia systems to facilitate teaching and learning processes. These technologies include learning management systems, digital libraries, virtual classrooms, online discussion platforms, mobile learning applications, and interactive multimedia resources. According to Roberts (2019), the adoption of e-learning technologies enables students to access educational materials beyond traditional classroom settings, thereby enhancing opportunities for continuous learning and improved academic performance. In business education, the integration of these technologies supports the development of analytical thinking, problem-solving abilities, and digital competencies required in modern business environments. Knowledge retention represents one of the most important indicators of learning effectiveness. It refers to the ability of learners to store acquired knowledge in memory and recall it when required for academic or practical purposes. Effective knowledge retention allows students to apply previously learned concepts to new situations, thereby strengthening their cognitive

development and professional competence. Studies have shown that digital learning platforms facilitate improved retention by enabling students to revisit learning materials, access recorded lectures and engage in multimedia-based learning experiences (Miller, 2018). When instructional content is delivered through interactive digital tools, learners are exposed to multiple forms of information processing which strengthens memory consolidation and improves long-term retention.

Assimilation, on the other hand, refers to the cognitive process through which learners integrate newly acquired knowledge into their existing intellectual frameworks. Assimilation allows students to relate theoretical knowledge to practical experiences and develop deeper conceptual understanding of academic content. Wang and Lee (2019) observe that interactive e-learning environments such as gamified instructional systems and collaborative digital platforms significantly improve students' assimilation of complex business concepts. By providing visual representations, simulations, and collaborative learning opportunities, e-learning technologies enable learners to actively construct knowledge rather than passively receive information. Empirical studies further indicate that the effectiveness of e-learning technologies depends largely on institutional support systems, digital infrastructure, and instructional design strategies. Ademiluyi (2019) reported that many educational institutions in Nigeria experience challenges related to inadequate ICT facilities, limited internet connectivity, and insufficient technical support for lecturers and students. Such limitations reduce the effectiveness of digital learning platforms and hinder the full realization of their educational benefits. Similarly, Bernard et al. (2009) argue that poorly structured online learning environments may overload learners with information, thereby reducing cognitive processing efficiency and weakening knowledge retention.

The theoretical foundations of this study further justify the importance of digital learning technologies in enhancing students' academic outcomes. The study is anchored on Social Constructivism Theory developed by Vygotsky (1978). The theory emphasizes that learning occurs through social interaction, collaborative engagement, and the use of cultural tools that facilitate knowledge construction. In digital learning environments, technological tools such as virtual classrooms, collaborative platforms, and discussion forums serve as mediating instruments through which students interact with instructors and peers to construct new knowledge. This theoretical perspective suggests that effective utilization of e-learning technologies can significantly enhance students' understanding, retention, and assimilation of academic concepts. Despite the increasing recognition of the benefits of e-learning technologies in higher education, many tertiary institutions in developing countries continue to experience difficulties in integrating these technologies effectively into teaching and learning processes. In Nigeria, rapid technological advancement has not always been accompanied by adequate investment in digital infrastructure, training programmes, and institutional support systems required for effective e-learning implementation. Sajuyigbe, Amusat, and Oloyede (2013) noted that insufficient technological resources and limited digital literacy among educators often constrain the effective utilization of ICT tools in educational institutions.

In Edo State, tertiary institutions such as universities, polytechnics, and colleges of education have increasingly adopted digital learning platforms to support instructional delivery in business education programmes. However, preliminary observations suggest that the extent to which these technologies enhance students' learning outcomes remains uncertain. Some institutions possess relatively advanced ICT infrastructure while others struggle with unstable internet connectivity, inadequate technological resources, and limited training opportunities for lecturers and students. These variations may influence the effectiveness of e-learning technologies in enhancing knowledge retention and assimilation among students. Existing literature has largely examined the general adoption of e-learning technologies in higher education without adequately focusing on their specific influence on knowledge retention and assimilation among business education students in Nigerian tertiary institutions. This gap limits the availability of context-specific empirical evidence needed to guide policy formulation and instructional innovation within business education programmes. Without adequate understanding of how e-learning technologies influence learning outcomes, educational institutions may struggle to optimize digital learning strategies for improving students' academic performance.

It is therefore necessary to empirically investigate the extent to which the utilization of e-learning technology enhances knowledge retention and assimilation among business education students in tertiary institutions in Edo State, Nigeria. The findings of this study will provide evidence-based insights that can guide educators, policymakers, and institutional administrators in strengthening the effective implementation of e-learning technologies within business education programmes.

Research Questions

1. To what extent does the utilization of e-learning technology enhance knowledge retention among

S/N	Items Statement	Mean	SD	Remarks
1	E-learning technology helps me understand complex business concepts more easily.	3.05	1.00	High Extent
2	I can connect theoretical knowledge with practical examples better using e-learning resources.	3.00	0.82	High Extent
3	E-learning tools make abstract ideas more relatable and easier to comprehend.	2.83	0.92	High Extent
4	Watching instructional videos on e-learning platforms improves my assimilation of course materials.	3.20	0.93	High Extent
5	E-learning simulations or case studies enhance my understanding of business processes.	2.82	0.89	High Extent
6	I find it easier to summarize lessons taught via e-learning platforms.	2.99	1.00	High Extent
7	Discussion forums on e-learning platforms help me better assimilate diverse perspectives.	3.00	0.87	High Extent
8	E-learning tools improve my ability to integrate new information with prior knowledge.	2.62	0.99	High Extent

2. To what extent does the utilization of e-learning technology enhance assimilation among business education students in Edo State tertiary institutions?

Research Hypotheses

H₀₁: There is no significant difference in the mean ratings of respondents regarding the extent to which utilization of e-learning technology enhances knowledge retention among business education students based on institutional type.

H₀₂: There is no significant difference in the mean ratings of male and female respondents regarding the extent to which utilization of e-learning technology enhances assimilation among business education students.

Methods

A descriptive survey research design was adopted for the study. The population comprised 558 final-year business education students from government-owned tertiary institutions offering business education programmes in Edo State. These institutions include the University of Benin, Ambrose Alli University Ekpoma, Auchu Polytechnic, and the Federal College of Education (Technical) Ekiadolor. A sample size of 233 respondents was selected using the Taro Yamane formula. Proportional sampling technique was used to distribute the sample across the institutions, while stratified random sampling was used to select respondents within each institution. The instrument used for data collection was a structured questionnaire titled *Utilization of E-Learning Technology for Enhancing Knowledge Retention, Assimilation and Skill Acquisition Questionnaire (UETEKRSAQ)*. The instrument contained 40 items designed to gather data on the utilization of e-learning technologies in enhancing learning outcomes among students. The instrument was validated by experts in business education and measurement and evaluation. Reliability testing using Cronbach alpha yielded a coefficient of 0.86. Mean and standard deviation were used to answer the research questions while Analysis of Variance (ANOVA) and Independent Sample t-test were used to test hypotheses at the 0.05 level of significance.

Result

Question One

To what extent does the utilization of e-learning technology enhance knowledge retention among business education students in tertiary institutions?

Table 1: Mean response of respondents on the extent to which utilization of e-learning technology to enhance knowledge retention among business education students in tertiary institutions

9	Visual aids in e-learning content (charts, graphs) enhance my understanding of topics.	3.05	0.89	High Extent
10	Regular assessments on e-learning platforms help me assimilate information over time.	2.95	1.00	High Extent
Weighted Mean		2.89		High Extent

Source: Field Survey, 2025

The analysis of data in Table 1 shows the mean and standard deviation of responses on the utilization of e-learning technology to enhance knowledge retention among business education students in tertiary institutions. The results indicate that e-learning technology significantly contributes to the enhancement of knowledge retention. Respondents strongly agreed that e-learning technology makes it easier to review course materials repeatedly (mean = 3.23), indicating that the ability to revisit materials is highly valued by students. Furthermore, respondents reported that they remember lessons better when taught using e-learning platforms compared to traditional methods (mean = 2.82), highlighting the effectiveness of e-learning in improving retention.

In addition, e-learning tools such as quizzes and flashcards are seen as helpful in reinforcing the understanding of business education topics (mean = 2.88). Recorded e-lectures also contribute to retaining key concepts (mean = 2.76), with respondents agreeing that the ability to listen to lectures again enhances their memory. The ability to study at one's own pace on e-learning platforms is another factor that contributes to better knowledge retention (mean = 2.87).

The multimedia content available through e-learning is also positively perceived, as it enhances memory of course content (mean = 2.85), and interactive activities on e-learning platforms improve recall (mean = 2.96). Additionally, the ability to revisit online discussion forums strengthens knowledge retention (mean = 2.82), while using e-learning resources has been reported to increase performance in tests and exams (mean = 2.60). Respondents also feel that e-learning technology helps them retain knowledge better than printed textbooks alone (mean = 2.66). In summary, the data reveal that e-learning technology significantly enhances knowledge retention among business education students in tertiary institutions to a high extent (weighted mean = 2.89).

Question Two

To what extent does the utilization of e-learning technology enhance assimilation skills among business education students in tertiary institutions?

Table 2: Mean response of respondents regarding the extent to which the utilization of e-learning technology enhances assimilation skills among business education students in tertiary institutions.

S/N	Item Statement	Mean	SD	Remarks
1	E-learning technology makes it easier for me to review course materials repeatedly.	3.23	0.86	High Extent
2	I remember lessons better when taught using e-learning platforms compared to traditional methods.	2.82	0.80	High Extent
3	E-learning tools (e.g., quizzes, flashcards) help reinforce my understanding of business education topics.	2.88	0.97	High Extent
4	Recorded e-lectures enhance my ability to retain key concepts.	2.76	0.89	High Extent
5	E-learning platforms allow me to study at my own pace, improving knowledge retention.	2.87	0.93	High Extent
6	The multimedia content available through e-learning enhances my memory of course content.	2.85	0.89	High Extent
7	Interactive activities on e-learning platforms improve my recall of learned materials.	2.96	0.90	High Extent
8	The ability to revisit online discussion forums strengthens my knowledge	2.82	0.95	High Extent

S/N	Item Statement	Mean	SD	Remarks
	retention.			
9	Using e-learning resources has increased my performance in tests and exams.	2.60	0.93	High Extent
10	E-learning technology helps me retain knowledge better than printed textbooks alone.	2.66	1.03	High Extent
Weighted Mean		2.89		High Extent

Source: Field Survey, 2025

The data in Table 2 shows the mean and standard deviation of responses on the extent of the utilization of e-learning technology to enhance assimilation skills among business education students in tertiary institutions. The results suggest that e-learning technology significantly contributes to improving students' ability to assimilate course materials. Respondents strongly agree that e-learning technology helps them understand complex business concepts more easily (mean = 3.05), indicating a high level of support for its role in simplifying difficult material. Additionally, the ability to connect theoretical knowledge with practical examples was rated highly (mean = 3.00), showing that e-learning resources are effective in bridging the gap between theory and practice. E-learning tools were also found to make abstract ideas more relatable and easier to comprehend (mean = 2.83), while watching instructional videos on e-learning platforms improves assimilation of course materials (mean = 3.20). This highlights the importance of multimedia resources in making learning more accessible and understandable. Further, e-learning simulations or case studies were seen as valuable for enhancing understanding of business processes (mean = 2.82). Respondents also found it easier to summarize lessons taught via e-learning platforms (mean = 2.99), suggesting that e-learning aids in synthesizing information. Discussion forums on e-learning platforms were perceived as beneficial for assimilating diverse perspectives (mean = 3.00), promoting collaborative learning. Visual aids such as charts and graphs were also reported to enhance understanding of topics (mean = 3.05), further supporting the role of multimedia in facilitating learning. Regular assessments on e-learning platforms were seen as helpful in assimilating information over time (mean = 2.95), suggesting that continuous evaluation aids retention and understanding. In summary, the data reveals that e-learning technology enhances assimilation skills among business education students in tertiary institutions to a high extent (weighted mean = 2.89).

H₀₁ There is no significant difference in the mean ratings of respondents on the extent to which utilization of e-learning technologies enhances knowledge retention among business education students based on institutional type.

Table 3: Summary of ANOVA on mean ratings of respondents on the extent to which utilization of e-learning technologies enhances knowledge retention among business education students based on institutional type

Institutional Type	N	Mean	SD	df	F	Sig.	Decision
University	70	2.89	0.45	2	6.661	.002	
Polytechnics	114	2.90	0.46				
College of Education	43	2.86	0.43	224			H₀₁ Retained
Total	277			226			

Source: Field survey, 2025

Data in Table 3 reveal that there are 70 respondents from universities, 114 from polytechnics, and 43 from colleges of education. The respondents' mean ratings to the extent to which the utilization of e-learning technologies enhances knowledge retention among business education students were 2.89 (SD = 0.45) for university respondents, 2.90 (SD = 0.46) for polytechnic respondents, and 2.86 (SD = 0.43) for respondents from colleges of education. These mean scores are very close to one another, and the low standard deviations suggest that the responses were relatively consistent within each group.

The ANOVA result indicates that there is a statistically significant difference in the mean ratings among the three institutional types, $F(2, 224) = 6.661, p = .002$. Since the p-value is less than the 0.05 level of significance, the null hypothesis which states that there is no significant difference in the mean ratings of respondents on the extent to which utilization of e-learning technologies enhances knowledge retention among business education students based on institutional type was rejected. This implies that respondents from universities, polytechnics, and colleges of education differed significantly in their views regarding the effect of e-learning technologies on knowledge retention.

Table 4: Post Hoc Tests

(I) Demographic	(J) Demographic	Mean Difference (I-J)	Sig.
University	Polytechnic	.00967	.990
	Colleges of Education	.26532*	.009
Polytechnic	University	.00967	.990
	Colleges of Education	.27499*	.003
Colleges of Education	University	-.26532*	.009
	Polytechnic	-.27499*	.003

Source: Field survey, 2025

Table 4 reveals the results of post hoc tests conducted to examine whether there were significant differences in the mean ratings of respondents regarding the extent to which the utilization of e-learning technologies enhances knowledge retention among business education students, based on institutional type. The analysis compared three groups: University, Polytechnic, and Colleges of Education. The findings show that there is no significant difference between the University and Polytechnic groups. The mean difference between these two groups is 0.00967, with a significance value of 0.990, which is greater than 0.05. This suggests that the perception of e-learning's impact on knowledge retention is similar for students in both University and Polytechnic institutions.

Significant differences were, however, observed between the University and Colleges of Education groups, as well as between the Polytechnic and Colleges of Education groups. The mean difference between the University and Colleges of Education groups is 0.26532, with a significance value of 0.009, which is less than 0.05. Similarly, the mean difference between the Polytechnic and Colleges of Education groups is 0.27499, with a significance value of 0.003, which is also less than 0.05. These results indicate that students from Colleges of Education perceive a significantly higher impact of e-learning technologies on knowledge retention compared to students from both Universities and Polytechnics.

In conclusion, the post hoc tests suggest that while there is no significant difference between the University and Polytechnic groups, significant differences exist between the Colleges of Education and the other two institutional types. This implies that students in Colleges of Education experience a notably different perception of e-learning's effectiveness in enhancing knowledge retention compared to their counterparts in Universities and Polytechnics.

H₀₂ There is no significant difference between the mean ratings of male and female respondents on the extent to which utilization of e-learning technologies enhances assimilation skills among business education students in tertiary institutions.

Table 5: Independent Samples t-test of the mean ratings of male and female respondents on the extent to which utilization of e-learning technologies enhances assimilation skills among business education students in tertiary institutions.

Gender	N	Mean	SD	t-cal	Df	P-value	Decision
Male	93	2.91	0.42	-1.305	225	0.193	H₀₄ Rejected
Female	134	2.98	0.41				

Source: Field Survey 2025

P>0.05

Data in Table 5 reveal that there are 93 male and 134 female respondents. The responses of both groups indicate that they agreed on the extent to which utilization of e-learning technologies enhances assimilation skills among business education students in tertiary institutions, with male respondents having a mean rating of 2.91 and a standard deviation of 0.42, while female respondents had a mean rating of 2.98 and a standard deviation of 0.41. The closeness of the standard deviations to the mean values suggests consistency in their responses.

The table further reveals that there is no significant difference in the mean ratings of male and female respondents on the extent to which utilization of e-learning technologies enhances assimilation skills ($t(225) = -1.31, p > 0.05$). Therefore, the null hypothesis which states that there is no significant difference between the mean ratings of male and female respondents on the extent to which utilization of e-learning technologies enhances assimilation skills among business education students in tertiary institutions was not rejected. This implies that both male and female respondents rated the utilization of e-learning technologies for enhancing assimilation skills similarly.

Discussion of Findings

Regarding knowledge retention, the study found that the utilization of e-learning technology enhances the ability of business education students to retain academic knowledge, with a weighted mean indicating a high extent of agreement among respondents. This finding reflects the growing importance of digital learning environments in supporting students' cognitive development and memory consolidation. In tertiary institutions in Edo State, where digital learning platforms such as virtual classrooms, online learning management systems, and multimedia instructional tools are increasingly utilized, this finding suggests that students recognize the value of e-learning technologies in improving their academic retention. The availability of recorded lectures, online learning materials, and multimedia presentations allows students to revisit instructional content repeatedly, thereby strengthening their ability to recall and apply knowledge. Previous studies, for instance Roberts (2019), emphasize that digital learning platforms significantly improve knowledge retention among students by providing flexible learning opportunities and repeated exposure to instructional materials. The null hypothesis (H01), which states that there is no significant difference in the mean ratings of respondents regarding the extent to which e-learning technology enhances knowledge retention based on institutional type, was rejected. This indicates that institutional differences such as availability of ICT infrastructure, internet connectivity, and technological resources influence students' perceptions of the effectiveness of e-learning technologies in improving knowledge retention.

The findings regarding assimilation revealed that e-learning technologies also enhance students' ability to assimilate academic knowledge, with respondents indicating a high extent of agreement on the effectiveness of digital learning platforms in supporting conceptual understanding. Assimilation involves integrating newly acquired information into existing knowledge structures, thereby enabling learners to develop deeper comprehension of academic concepts. In digital learning environments, students are exposed to interactive learning experiences such as multimedia demonstrations, collaborative discussions, and simulation-based learning activities that promote critical thinking and conceptual understanding. This finding aligns with the research conducted by Wang and Lee (2019), who observed that interactive e-learning platforms significantly improve students' assimilation of complex business concepts through gamification and collaborative learning approaches. The null hypothesis (H02), which states that there is no significant difference in the mean ratings of male and female respondents regarding the extent to which e-learning technology enhances assimilation among business education students, was retained. This finding suggests that gender does not significantly influence students' perception of the effectiveness of e-learning technologies in enhancing assimilation. Both male and female students appear to benefit equally from the use of digital learning platforms, indicating that e-learning technologies provide inclusive learning opportunities for students regardless of gender differences.

In summary, the study revealed that the utilization of e-learning technology significantly enhances knowledge retention and assimilation among business education students in tertiary institutions in Edo State. However, variations in institutional resources such as ICT infrastructure, internet accessibility, and technological support systems may influence the extent to which these benefits are realized across different institutions. The findings therefore suggest that while e-learning technologies provide valuable opportunities for improving learning outcomes, their effectiveness largely depends on the availability of adequate digital infrastructure, effective instructional design, and students' active engagement with digital learning platforms.

Conclusion

The study established that the utilization of e-learning technology represents a critical instructional strategy for improving learning outcomes among business education students in tertiary institutions in Edo State. The findings revealed that e-learning technologies significantly enhance students' knowledge retention and assimilation, emphasizing the importance of digital learning platforms in supporting effective academic engagement and conceptual understanding. The results also indicate that while gender differences did not significantly influence students' perceptions of assimilation through e-learning technologies, variations in institutional resources and technological infrastructure may influence the extent to which these technologies improve knowledge retention. This highlights the need for tertiary institutions to strengthen digital infrastructure and instructional support systems to maximize the benefits of e-learning technologies in business education programmes.

Recommendations

1. Tertiary institutions in Edo State should increase their investment in e-learning technologies that can enhance knowledge retention. This can be done by incorporating more interactive tools such as multimedia content, quizzes, and learning management systems that allow students to revisit lessons and test their knowledge
2. Lecturers in tertiary institutions in Edo State should adopt e-learning technologies and platforms that foster better assimilation of course materials. This could involve introducing collaborative online learning environments, such as virtual study groups and discussion boards, encouraging deeper engagement and comprehension of academic content.

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