

EFFECT OF APPLICATION OF MOBILE LEARNING ON STUDENTS' ACADEMIC ACHIEVEMENT IN CARPENTRY AND JOINERY CRAFT IN EDO STATE TECHNICAL COLLEGES

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Abstract

The research investigated the effect of application of mobile learning on students' academic achievement in carpentry and joinery craft in Edo State technical colleges using quasi-experimental design. Specifically, the study focused on how mobile learning affect skills in upholstery, furniture-making, and wood joint among students. Two research questions guided the study and two null hypotheses were formulated and tested at a significance level of .05. The study used census population of all 58 NTC II students from the three technical colleges that offers carpentry and joinery craft out of the five Edo State technical colleges. The instrument was the Carpentry and Joinery Craft Achievement Test (CAJCAT), which was validated by three experts. Kuder Richardson (KR-21) reliability method was applied to evaluate the internal consistency of the instrument, yielding a reliability coefficient of .86. Achievement test copies were distributed to all 58 students, with 29 students assigned to each group. The research questions were answered using mean (\bar{x}) and standard deviation, while the hypotheses were tested with Analysis of Covariance (ANCOVA). The findings indicated that the application of mobile learning positively affect students' academic performance in Upholstery, Furniture-Making and Wood Joints. Students' achieved higher scores compared to those who relied on traditional method of instructions. Additionally, the null hypotheses were rejected. Consequently, the study recommended that both governmental and non-governmental organizations support students in Carpentry and Joinery Craft by providing mobile devices to facilitate digital learning in Edo State among others.

Keywords: Education, Mobile Learning, Academic Achievement, Carpentry and Joinery Craft, Technical Colleges

Introduction

Education is the hub of all the developmental strides of a nation, and such strides may be informing of economic, political and sociocultural aspects of the peoples' life. Edison (2018) stated that education is the process of facilitating learning, or the acquisition of knowledge, skills, values, beliefs and habits by individuals in a given society through storytelling, discussion, teaching, training, and directed research under the guidance of a professional known as the teacher.

Tipalti (2018) asserted that education is the guide to light as to bring about success, as it is a process of acquiring knowledge, belief, values, skills and habits which teaches one to be true human being and may be formal or informal in nature. Education is therefore regarded as a powerful means for the social, economic, and political transformation of the country, which can be realized by the creation of educational institutions, such as universities, polytechnics, technical colleges among others

Technical colleges are regarded as the principal vocational institutions in Nigeria. Technical colleges, according to Nnadi and Saue (2023); Oviawe and Anaele (2020), are vocational training institutions in Nigeria that admit junior secondary school leavers to senior secondary schools and provide them with a full vocational course of three years' duration. To the Federal Republic of Nigeria (FRN) (2013), technical colleges form part of technical and vocational education designed to produce craftsmen at the secondary school level and master craftsmen at the advanced craft level. The goals of the functional technical colleges are to provide trained manpower in the applied science, technology and business particularly at craft, advanced craft and technician levels; provide the technical knowledge and vocational skills necessary and give training and impart the necessary skills required for agriculture, commercial and economic development and give training and impart the necessary skills to individual who shall be self-reliant economically (Atsumbe in Saue, 2020). They train craftsmen in auto mechanics, plumbing, cabinet making, painting and decorating, welding, electrical installation, radio and television repair, building construction, carpentry and joinery and few others.

The craft of carpentry and joinery represents a fundamental aspect of the curriculum within technical and vocational education. This program is specifically offered at technical colleges across Nigeria. Carpentry and joinery as described in the National Board for Technical Education (NBTE) curriculum in Igweagbara (2021) and Oviawe and Anaele (2020) is one of the careers in technical colleges whose primary purpose is to prepare individual recipients for employment in recognized building construction firms or to establish carpentry and joinery workshop where they can employ others. Craftsmen in carpentry and joinery can acquire essential skills that provide them with various business prospects within the trades, including the construction of upholstery, furniture fabrication, and the creation of wood connections, among others.

Upholstery and furniture-making provide furniture, especially seats, with padding, springs, webbing, and fabric or leather covers (Shobowale, 2015). Upholstery is the craft or trade of upholstering. While, Furniture-making according to Oviawe, et al. (2017), is the practice of using various woodworking skills to create cabinets, shelves and chairs. Furniture-making therefore, involves techniques and skills such as creating appropriate joints with the use of woodworking facilities and consumable-materials. Learning these skills will help to boost the economy, for many preferred wooden furniture instead of using other materials.

Woodwork joint is the spot where usually two pieces of wooden construction are joined together to form a rigid self-supporting and permanent construction. Woodworking joints can be formed between the edges or between the end and the face, in the direction of the length, at right angles or it may be at an angle, other than a right angle (Adamu & Idris, 2016). Glues or fasteners (nails, screws, bolts...) are used to increase the strength, effectiveness and rigidity of woodworking joints. Moreso, Judd, et al. (2012) stressed that woodworking joint is the connecting and securing the separate members of the wooden construction to one another by means of specific cuts on the ends and/or sides of the members. Recently, various devices, including audio, video, and audio-visual technologies, have been utilized globally to improve student performance, with mobile phones, laptops, tablets as prominent examples.

Mobile learning, also known as m-learning, is a new direction in pedagogy and education, which is organized using mobile technologies. McQuiggan, et al. (2015) defined mobile learning as instant and optionally accessible, anywhere and anytime learning, which helps create our knowledge, satisfy our curiosity, collaborate with others and enrich our experiences. Mobile learning is the capability to attain or provide educational content on individual pocket devices such as smartphones and mobile phones. Mobile learning allows flexible learning and is a mixture of Information and Communication Technologies (ICT) providing education anytime and anyplace. In mobile learning learners can use mobile devices to access educational resources, share with others, or produce content, both inside and outside classrooms. Nnadi and Saue (2023) expressed the imperativeness of mobile learning in education as giving access to documents or document libraries, access quizzes and self-assessment as question or games, participate in lessons and tutorials, receive lectures archived or broadcast live, access to video clip or audio libraries, read asynchronous postings, exhibit student work (e-market), participate in virtual learning communities on the go.

The rapid development of the application of mobile learning to instructional delivery can be attributed to the enhancements in wireless communication technology, the increased capabilities of mobile devices and technologies. Use of these technologies turns out to be well aligned with strategic educational goals such as improving student retention and achievement, supporting differentiation of learning needs, and reaching learners who would not otherwise have the opportunity to participate in education (Nnadi & Saue, 2023). The pervasive use of mobile phones and the growing accessibility of various portable and wireless devices have significantly transformed the realm of technology-enhanced learning and have markedly improved student academic achievement.

Academic achievement according to Akuda and Izu (2016) is the knowledge attained or skills developed in the school subjects, usually determined by test scores or marks assigned by the teacher. Oviawe, et al. (2021) said students' performance can be improved upon through strategies. Also, Wordu (2021) asserted that academic achievement is dependent on several factors; top amongst them as regards this study are instructional approach and learning environment approach. Consequently, the investigation into the effect of application of mobile learning on the academic performance of students in carpentry and joinery craft in Edo State technical colleges is highly relevant.

Statement of the Problem

Students enrolled in carpentry and joinery craft at technical colleges must acquire essential skills that promote self-sufficiency or facilitate employment within the industry and related woodworking sectors as junior workers upon graduation. Nevertheless, a significant number of these students face challenges in achieving satisfactory results at the end of the final NABTEB examination. This is reflected in the total percentage performance evaluations reported by various NABTEB chief examiners from 2020 to 2024 (42.5%, 45.8%, 40.7%, 28.7%, and 43.56%), which indicated notably low scores in carpentry and joinery craft. There could be definite determinants responsible for the constant failure of students' academic performance in carpentry and joinery craft in technical colleges in Edo State. The problem of students under performance in technical colleges has been a much discussed educational issue. Many reasons accounted for student's poor performance in science and technology areas as reported by researchers (Oviawe, et al., 2015). The low performance noted by the chief examiners may stem from multiple factors, including a critical shortage of qualified woodwork instructors, insufficient resources, ineffective teaching and learning methodologies, and a lack of requisite practical skills among woodwork technology

teachers for hands-on projects. Consequently, the researchers have shifted focus from conventional instructional methods to the application of mobile designed to facilitate ease of learning and allow students to study within their comfort zones. Therefore, the problem of study is that students' academic performance in carpentry and joinery craft is poor.

Purpose of the Study

The aim of the study was to determine the effect of mobile learning application on students' academic achievement in carpentry and joinery craft in technical colleges in Edo State. Specifically, the study sought to:

1. determine the effect of application of mobile learning on students' academic achievement in upholstery and furniture-making in in Edo State technical colleges.
2. ascertain the effect of application of mobile learning on students' academic achievement in wood joints in Edo State technical colleges.

Methods

The research utilized a quasi-experimental design, basically the pre-test and post-test non-equivalent design. Quasi- experimental design involves the use of pre-test and post-test with experimental and control groups (Ogundu, 2018). This simply means that experiments are applied to real situations.

The study's population consisted of all 58 NTC II students enrolled in carpentry and joinery craft programs across three technical colleges that provide this specialization out of a total of five Edo State technical colleges. The list of carpentry and joinery craft (C&JC) students was provided by the Vice Principal for Administration at each of the three technical colleges offering this craft for the academic session of 2023/2024.

The study was a census as the entire population was studied. A census is a quantitative research method in which all the members of the population are enumerated. This is in consonance with Maduabum in Wordu (2021) who stated that a survey in which the entire population is studied is referred to as census. The decision to employ a census method stems from the limited population size involved. Subsequently, complete cohorts of students from the technical colleges were randomly allocated to the respective treatment conditions. Each technical college was segmented into two groups, each consisting of 29 students, determined through random sampling, to form the Mobile Learning experimental group and the Conventional group, respectively.

The instrument for the study was titled: Carpentry and Joinery Craft Achievement Test (CAJCAT) developed by the researcher. The CAJCAT consists of two sections: section A was used to take students information. While, section B was based on the study objectives of upholstery and furniture-making and Wood joints. The questions were a multiple-choice type with four options A-D. The test was developed from the unit of the content areas of the topics selected for the study.

The instrument was subjected to content validity by three experts from the Department of Vocational and Technical Education, Faculty of Education, Ambrose Alli University, Ekpoma, Edo State. Their suggestions and recommendations were put into consideration in the final draft of the instrument

The trial test for determining the coefficient of reliability of the CAJCAT instrument was carried out using test-re-test reliability technique. The instrument was administered on carpentry and joinery craft students at Government Science and Technical College, Agbor, Delta State. The objectives answer sheets were marked by the researcher and scores kept. After an interval of 17 days, the CAJCAT was re-administered to the same sample of students. The objectives answer

sheets were also marked by the researcher and the scores obtained in the pre-test and post-test were correlated, given a reliability coefficient of 0.86 using Kuder Richardson - 21.

The data for the study was analyzed using mean and standard deviation, and Analysis of Covariance (ANCOVA). Mean and Standard Deviation were used to analyze the research questions, while ANCOVA was used to test the hypotheses at .05 level of significance. ANCOVA was used to determine whether difference were significant.

Results

Research Question 1: Is there any difference between the pre-test mean score of students taught upholstery and furniture-making using mobile learning and textbook in Edo State technical colleges?

Table 1

Mean and Standard Deviation for Achievement Scores of Students who learned Upholstery and Furniture-Making with Mobile Learning and those who learned using Textbook

Group	N	Pre-test		Pre-test		Mean-diff	Mean-Gain
		\bar{x}	SD	\bar{x}	SD		
Experimental	29	9.71	2.220	40.00	6.339	30.29	23.29
Control	29	9.60	2.440	17.21	1.241	7.61	

Table 1 illustrates the comparative mean scores of students' achievements in upholstery and furniture-making before and after the instructional intervention for both the experimental and control cohorts. The findings reveal that the experimental group exhibited a pre-test mean score of 9.71 (standard deviation of 2.220) and mean score of 40.00 (standard deviation of 6.339). The calculated difference between the pre-test mean scores for the experimental group was 30.29. In contrast, the control group recorded a pre-test mean score of 9.60 (standard deviation of 2.440) and mean score of 17.21 (standard deviation of 1.241), resulting in a difference of 7.61. The overall mean gain for both the experimental and control groups was 23.29, demonstrating that the experimental group outperformed the control group. This indicates that participants who utilized the mobile learning achieved superior results compared to those who garnered knowledge through traditional textbooks.

Research Question 2: Is there any difference between the post-test mean score of students taught wood joint using mobile learning and textbook in Edo State technical colleges?

Table 2

Mean and Standard Deviation for Achievement Scores of Students who learnt Wood Joint with Mobile Learning and those who learned using Textbook

Group	N	Post-test		Post-test		Mean-diff	Mean-Gain
		\bar{x}	SD	\bar{x}	SD		
Experimental	29	10.87	3.209	40.51	6.751	29.87	20.83
Control	29	10.89	2.545	19.93	4.953	9.04	

Table 2 presents the average scores from post-tests concerning students' performance in wood joint skills for both the experimental and control groups. The findings indicate that the experimental group exhibited a post-test mean score of 10.87 with a standard deviation of 3.209, followed by a post-test mean score of 40.51, which had a standard deviation of 6.7651. The mean score difference between the post-test for the experimental group was 29.87. Conversely, the control group recorded a post-test mean score of 10.89 with a standard deviation of 2.545 and mean score of 19.93 with a standard deviation of 4.953, resulting in a mean score difference of 9.04. The mean gain for both the experimental and control groups was calculated to be 20.83. These results illustrate that the experimental group outperformed the control group, suggesting that students who utilized the mobile learning achieved superior results compared to their counterparts who relied on traditional textbooks.

Test of Hypotheses

H₀₁: There is no significant difference between the mean scores of students who learned upholstery and furniture-making with mobile learning and those who learned using textbook in Edo State technical colleges.

Table 3

ANCOVA on the difference between Students who learnt Upholstery and Furniture-Making with Mobile Learning and those who learnt using Textbook

Source	Type III Sum of Squares	Df	Mean Square	F-calc.	Sig.
Corrected Model	2.593 ^a	1	2.593	.454	.502
	12451.859 ^b	1	12451.859	570.662	.000
Intercept	8558.818	1	8558.818	1497.743	.000
	75955.455	1	75955.455	3480.996	.000
Group	2.593	1	2.593	.454	.502
	12451.859	1	12451.859	570.662	.000
Error	497.160	57	5.714		
	1898.343	57	21.820		
Total	9063.000	58			
	91008.000	58			
Corrected Total	499.753	58			
	14350.202	58			

The covariance analysis of students' achievement scores, as shown in Table 3, reveals a calculated F-value of 570.662, accompanied by a probability value (P) of .000. This probability value is below the significance threshold of .05 set by the researcher. Consequently, the F-calculated value exceeds the .05 significance level, leading to the rejection of the null hypothesis in favor of the alternative hypothesis. This finding indicates a statistically significant difference in the mean achievement scores between students who engaged in upholstery and furniture-making instruction via a mobile learning application and those who utilized textbooks in technical colleges. Therefore, it can be concluded that students who received training through the application of mobile learning outperformed their counterparts who relied on textbook learning.

H₀₂: There is no significant difference between the mean scores of students who learned wood joint with mobile learning and those who learned using textbook in Edo State technical colleges.

Table 4

ANCOVA on difference between Students who learnt Wood Joint with Mobile Learning and those who learnt using Textbook

Source	Type III Sum of Squares	Df	Mean Square	F-calc.	Sig.
Corrected Model	21.379 ^a	1	21.379	2.542	.114
	9421.848 ^b	1	9421.848	267.873	.000
Intercept	9581.604	1	9581.604	1139.370	.000
	81276.724	1	81276.724	2310.779	.000
Group	21.379	1	21.379	2.542	.114
	9421.848	1	9421.848	267.873	.000
Error	731.632	57	8.410		
	3060.040	57	35.173		
Total	10346.000	58			
	94392.000	58			
Corrected Total	753.011	58			
	12481.888	58			

The covariance analysis of students' achievement scores, as detailed in Table 4.8, revealed a computed F value of 267.873, accompanied by a probability value of $P = .000$. This probability value is significantly lower than the .05 level of significance set by the researcher ($P < .05$), indicating that the f-ratio exceeds this significance threshold. Consequently, this led to the rejection of the null hypothesis in favor of the alternative hypothesis. Therefore, the findings indicate a statistically significant difference between the mean scores of students who were instructed in wood joint techniques using a mobile learning and those who received instruction through traditional textbooks within the Edo State technical colleges. To summarize, students utilizing the mobile learning for wood joint instruction outperformed their peers who learned through textbooks.

Discussion of Findings

Table 1 presents the comparative mean scores of students' achievements in upholstery and furniture-making across both the experimental and control groups during pre-tests and post-tests. The findings reveal that the experimental group attained a pre-test mean score of 9.71 (standard deviation = 2.220) and a post-test mean score of 40.00 (standard deviation = 6.339), resulting in a mean difference of 30.29. In contrast, the control group showed a pre-test mean score of 9.60 (standard deviation = 2.440) and a post-test mean of 17.21 (standard deviation = 1.241), leading to a mean difference of 7.61. The mean gain between the experimental and control groups was noted at 23.29. These results indicate that the experimental group outperformed the control group, suggesting that learners utilizing the mobile learning had superior performance compared to those studying from textbooks.

Furthermore, the analysis of covariance presented in Table 3 showed an F calculated value of 570.662, with a corresponding probability value ($P = .000$). This probability is below the .05 significance level set by the researcher, indicating that the calculated F value surpasses this significant threshold. As a result, the null hypothesis is rejected in favour of the alternative hypothesis, confirming a significant disparity between the mean scores of students engaged in upholstery and furniture-making through the application of mobile learning versus those relying on textbooks in technical colleges. In essence, students who utilized mobile learning achieved better outcomes than their counterparts who used textbook resources. This assertion aligns with the findings of Usoro & Utuk (2018), who emphasized that furniture consists of both movable and

immovable constructs designed to facilitate various human activities such as dining, seating, sleeping, storage, and overall comfort.

Table 2 illustrates the pre-test and post-test mean scores of students' achievements in wood joints, segmented by experimental and control groups. The results indicate that the experimental group achieved a pre-test mean score of 10.87 (standard deviation = 3.209) and a post-test mean score of 40.51 (standard deviation = 6.765). The difference between the pre-test and post-test mean scores for the experimental group was calculated at 29.87. In comparison, the control group recorded a pre-test mean score of 10.89 (standard deviation = 2.545) and a post-test mean of 19.93 (standard deviation = 4.953), resulting in a mean difference of 9.04 and a mean gain of 20.83 between the two groups. This further supports the finding that the experimental group exhibited superior performance compared to the control group, reinforcing the notion that learners engaging with the mobile learning outperformed those utilizing textbooks. Additionally, the analysis of covariance outlined in Table 3 indicated an F calculated value of 267.873, coupled with a probability value of $P = .000$. This probability value also falls below the .05 significance level as defined by the researchers, highlighting that the calculated F ratio exceeds the significant level of .05. Therefore, the null hypothesis is rejected in favour of the alternative hypothesis, indicating a significant difference between the mean scores of students who engaged with the mobile learning for wood joints compared to those who used textbooks in Edo State technical colleges. In summary, students learning wood joints through the application of mobile learning demonstrated better performance than those using traditional textbooks. This finding is supported by Isaksson & Thelandersson (2013) who stated that current methods for considering the effect of joints on the moisture conditions of wood are based on purely empirical models. Niklewski, et al. (2018) empirical models rely on long-term measurements for rating the moisture performance of specific joints, which is problematic due to the resource intensive nature of such measurements.

Conclusion and Recommendations

The study concluded that students enrolled in Carpentry and Joinery Craft (C&JC) who utilized mobile learning for their education in upholstery, furniture-making, and wood joints exhibited superior performance compared to their counterparts who relied on traditional textbooks. Consequently, the promotion of Carpentry and Joinery Craft (C&JC) among various technical college programs could be enhanced through the effective introduction and application of mobile learning as an educational method or strategy. Additionally, the research demonstrated a statistically significant difference at the .05 level in the average achievement of students who learned via the use of mobile learning compared to those who used textbooks in their studies of upholstery, furniture-making, and wood joints.

In light of the outcomes of the research, several recommendations have been proposed:

1. The government, along with Non-Governmental Organizations (NGOs), ought to provide Carpentry and Joinery Craft (C&JC) students in Edo State with mobile devices to facilitate their engagement in digital learning.
2. School administration should support C&JC students in the installation of mobile learning applications on their devices.
3. There should be ongoing training sessions for C&JC educators to enhance their competencies in employing mobile learning strategies across all subject disciplines.
4. The school administration, in collaboration with the Edo State government, must ensure reliable and consistent electricity supply, at least during school hours, to enable effective utilization of students' devices.

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5. Certain class assignments, home tasks, and assessments should be conducted using mobile devices, promoting a digital-based approach.

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