Journal of CUDIMAC (J-CUDIMAC)
ISSN 0794-4764 (Print) ISSN 2651-6063 (Online)
Vol. 11, No.1, September, 2023

EFFECT OF STATION ROTATION MODEL IN TEACHING MICROSOFT ACCESS TO SENIOR SECONDARY SCHOOL STUDENTS IN ENUGU STATE, NIGERIA

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Abstract

This study explored the effectiveness of the Station Rotation Model in teaching Microsoft Access to Senior Secondary School students. The study adopted a quasi-experimental design with a non-equivalent control group design., the sample involved 213 students from both urban and rural schools in Enugu State, Nigeria. The participants were divided into an experimental group, which was taught using the Station Rotation Model, and a control group, which received traditional instruction. Data were collected through a pre-test and post-test Microsoft Access Database Achievement Test (MADAT). The results showed that students in the experimental group performed better than those in the control group, demonstrating greater engagement, understanding, and retention of knowledge. Furthermore, no significant performance differences were observed between urban and rural students exposed to station mode highlighting the model's potential to provide equitable learning opportunities. The findings emphasized the value of incorporating interactive, student-centered methods in technology education and called for professional development programs to equip educators with the skills necessary for implementing blended learning approaches in order to improving database management proficiency among secondary school students.

***Keywords**: Station Rotation Model, Microsoft Access, blended learning, database management, technology education,*

Introduction

Database management encompasses the systematic organization, retrieval, and alteration of data, thereby facilitating effective information processing and informed decision-making (Elmasri & Navathe, 2016). Serving as an intermediary between databases and users or programs, a Database Management System (DBMS) ensures data integrity, security, and consistency. DBMSs are critical for managing extensive datasets in domains such as business, education, and scientific research (Silberschatz et al., 2019). Consequently, tools like MySQL, Oracle Database, PostgreSQL, SQLite, and Microsoft Access are widely used across sectors (Connolly &Begg, 2014). This justifies the inclusion of Microsoft Access as a key topic in the West African Senior Secondary School Certificate Examination (WASSCE) curriculum (West African Examination Council, 2021).

The integration of Microsoft Access into the WASSCE syllabus is a strategic effort to bridge the skills gap in data management across fields like business, education, and governance. Research suggests that acquiring DBMS competencies—particularly through Microsoft Access—equips students with practical skills that prepare them for a range of information-based professions and advanced studies in information technology (Ramakrishnan & Gehrke, n.d). Although Microsoft Access is a key component of the West African Examinations Council (WAEC) syllabus, the availability of qualified instructors to effectively teach the subject remains limited. The WAEC syllabus for Data Processing for instance, explicitly outlines Microsoft Access as a required topic under Database Management Systems (DBMS), expecting students to gain competence in creating and manipulating database files using such tools (West African Examinations Council, 2021). In view of this citation, many secondary schools lack the human resources needed to deliver instruction effectively, particularly in specialized areas such as Microsoft Access, which demands both technical expertise and pedagogical skills (Teachers Registration Council of Nigeria, TRCN). This shortage of qualified technical educators is a significant challenge in Nigeria's education sector, as highlighted by the former Minister of Education, Malam Adamu Adamu, who reiterated that this shortage of qualified instructors is further exacerbated by environmental disparities between urban and rural settings (Daily Trust 2017, Punch 2023,)

In urban areas, for instance, schools are more likely to have access to robust ICT infrastructure, including well-equipped computer laboratories, stable electricity, and high-speed internet connectivity, which collectively support the effective teaching and learning of digital subjects such as Microsoft Access. These resources enable students to interact with sophisticated database management tools, participate in hands-on practical sessions, and gain experiential knowledge that enhances their technical competencies. The availability of such infrastructure significantly influences the successful integration of technology into the classroom and contributes to improved student engagement and learning outcomes (Irele,2021). Furthermore, urban schools often benefit from a higher concentration of trained and experienced teachers who possess specialized knowledge in computer science and database systems. Educators with greater exposure to ongoing professional development—such as ICT training sessions, certification courses, and collaborative learning communities—are better equipped to effectively teach advanced digital tools like Microsoft Access (Darling-Hammond et al., 2020; Ifenthaler & Yau, 2022; Pedro et al., 2021). This advantageous blend of technological access

and teacher preparedness positions urban schools to better implement curriculum objectives and prepare students for the demands of a digitally-driven society.

Conversely, rural schools often struggle with limited infrastructure, irregular power supply, and inadequate access to training opportunities for teachers (Ogunode & Ahaotu (2020). These environmental factors create significant barriers to equitable instruction, thereby widening the digital divide and undermining the intent of the standardized syllabus. Rural educational institutions also encounter obstacles such as inadequate infrastructure and limited exposure to technology (Obi & Chukwu, 2020). In light of the disparities observed, it is evident that implementing a dual-faceted instructional approach is essential to accommodate and align with the unique characteristics of each environment. For instance, in rural settings, emphasizing offline database management and integrating community-based examples can enhance the relevance and resource efficiency of Microsoft Access instruction (Olanrewaju et al., 2021). Conversely, urban schools can capitalize on cloud-based databases and advanced features, owing to their superior technological accessibility. Consequently, there is obviously a compelling need for the exploration of blended learning models.

The idea of exploration of blended learning models is based on the fact that blended learning models combine traditional face-to-face instruction with digital or online components, creating a more flexible and engaging learning environment. According to Hrastinski (2019), blended learning is a teaching approach that strategically integrates synchronous and asynchronous learning activities using digital tools and classroom interaction. Similarly, Picciano et al. (2015) define blended learning as a hybrid instructional model that merges physical and virtual learning spaces to support varied learning preferences and improve educational effectiveness. Blended learning provides several educational benefits. It enhances student engagement through interactive and multimedia content and allows for personalized learning, where students can progress at their own pace (Boelens et al., 2017). Furthermore, it promotes deeper learning by encouraging self-directed study, collaboration, and increased access to educational resources anytime and anywhere (Raes et al., 2020). Examples of Blended Learning Models include; Flipped Classroom – Students learn new content online before class and use classroom time for discussion and application (Lo & Hew, 2017) Enriched Virtual Model – Most instruction happens online, with occasional in-person sessions for support and interaction. Station Rotation Model – Students rotate between learning stations, including at least one with

online learning (Michael & Staker, 2015). Among these models, for the sake of factors like environment, station rotation model was adopted.

The rationale behind the adoption of Station Rotation Model is because it requires limited technological infrastructure, making it suitable for areas with inconsistent internet access (Horn & Staker, 2015). Additionally, it allows for differentiated instruction within the classroom, supporting diverse learner needs regardless of location (Boelens et al., 2017). These features make it adaptable and inclusive across varying educational environments. The station rotation model, which involves dividing the class into smaller groups that rotate through different instructional stations—such as teacher-led, collaborative, and individual learning environments (Horn & Staker, 2015) promotes differentiated instruction, addressing the varied learning needs and paces of students. This approach is anticipated to yield benefits in the context of complex subjects such as Microsoft Access (Tucker, 2013). As students alternate between teacher-led instruction, peer collaboration, and technology-enhanced learning, the need for supportive resources and robust infrastructure becomes critical—especially in addressing disparities between urban and rural educational contexts (UNESCO, 2015; Darling-Hammond et al., 2020). By employing the Station Rotation Model, teachers can tailor instruction to students' varied learning needs, promote hands-on learning experiences, and improve understanding of complex software like Microsoft Access. This pedagogical approach presents a promising strategy for addressing existing instructional challenges and enhancing DBMS competency among secondary school students (Tremmel, 2018).

However, the promise that this pedagogical approach presents, appear not to have been properly researched upon. For instance, **w**hile the WAEC syllabus includes Microsoft Access as a required topic, there is limited empirical research examining how context-sensitive instructional strategies—like the Station Rotation Model—impact the teaching and learning of Microsoft Access, especially across rural and urban school settings. This study addressed this gap by determining the effectiveness of Station Rotation Model in teaching Microsoft Access in diverse educational environments. Again, although the literature acknowledges the challenges of limited teacher expertise and inadequate infrastructure, there is a dearth of in-depth studies that systematically analyze how these variables influence students' performance and engagement in learning Microsoft Access. In addition, there is a lack of empirical evidence on how urban-rural infrastructural differences influence the application and outcomes of station-based blended learning strategies in ICT-related subjects. This study therefore sought

to fill the gap by exploring how this factor affects instructional delivery and learning outcomes in database management education at the senior secondary level. With these gaps in mind and with the given persistent challenges in teaching Microsoft Access and the uneven distribution of educational resources, this study on the Effect of Station Rotation Model Techniques in Teaching Microsoft Access in Senior Secondary Schools in Enugu–is timely. It sought to provide evidence-based insights into how innovative, flexible teaching models can improve the quality of ICT education across varied school environments

Statement of problem

The teaching of Microsoft Access in senior secondary schools faces significant challenges, primarily due to its perceived complexity, which discourages both teachers and students. Many instructors are reluctant to teach Microsoft Access due to its intricate interface and advanced features, leading to poor student performance in related examinations. Additionally, there is a shortage of qualified Teachers who can effectively deliver lessons on the software. These challenges hinder students' ability to acquire essential database management skills, limiting their career prospects in technology-related fields. Given these issues, it was crucial to explore whether the station rotation model can effectively address these challenges in the teaching of Microsoft Access. Therefore, the central question of this research is: Can the station rotation model (SRM) improve the teaching and learning of Microsoft Access in senior secondary schools with a view to enhancing skill acquisition and overcoming the current challenges faced by both teachers and learners.

Purpose of the study

Generally, this research, investigated the effect of station rotation model in teaching Microsoft Access in senior secondary schools. Specifically**,** the study

1. compared the mean scores of students who were taught Ms Access using the station rotation model with those taught with other traditional teaching methods.
2. compared the mean score differences in performance of students in Urban and Rural Senior Secondary Schools students taught Microsoft Access using conventional teaching methods.
3. compared the mean score differences in performance of students in Urban and Rural Senior Secondary Schools students taught Microsoft Access using the station rotation model.

Research Questions

1. What is the mean scores of students who were taught Ms Access using the station rotation model and those taught through traditional teaching methods?
2. What is the mean score differences in performance of students in Urban and Rural Senior Secondary Schools students taught Microsoft Access using conventional teaching methods?
3. What is the mean score differences in the in performance of students in Urban and Rural Senior Secondary Schools students taught Microsoft Access using the station rotation model?

Hypothesis

Ho_1: There is no significant difference in the mean scores of students in Urban and Rural Senior Secondary Schools students taught Microsoft Access using the station rotation model.

Methodology.

The study adopted a quasi-experimental research design, specifically the pretest-posttest non-equivalent control group design. This design was suitable for assessing the effectiveness of the Station Rotation Model (SRM) in teaching Microsoft Access among Senior Secondary School students in selected urban and rural areas of Enugu State. The design enabled comparison between an experimental group that received instruction using the SRM technique and a control group that was taught using conventional teaching methods. The population for the study comprised 2,057 Senior Secondary School (SS II) students from 25 public secondary schools in Enugu South Local Government Area (LGA) and Nkanu West LGA of Enugu State. Thirteen of the schools were located in urban areas (Enugu South LGA), while twelve were situated in rural areas (Nkanu West LGA). Reason for the two LGAs is because Enugu south is urban area while Nkanu West is rural area. A multi-stage sampling technique was employed to select a representative sample of 213 SS II students. The choice of Senior Secondary II (SS II) students was justified on the basis that they had adequate exposure to the Data Processing curriculum, including database concepts, but had not yet been overwhelmed by the pressures of final-year external examinations. This made them ideal for the experimental intervention.

The sample was distributed as follows: Urban Area (Enugu South LGA sample size is 113, split in this order; Experimental Group 58students, Control Group: 55 students, Rural Area (Nkanu West LGA), Experimental Group: 53 students, Control Group: 47 students. The

schools and students were selected using stratified random sampling, ensuring balanced representation from both urban and rural locations. Data were collected using a researcher-developed instrument titled Microsoft Access Database Achievement Test (MADAT). The test consisted of structured items designed to assess students' cognitive understanding and practical skills in using Microsoft Access as covered in the Data Processing curriculum. The face and content validity of the MADAT instrument were ascertained by a panel of three experts two in Computer Science education and one in Measurement and Evaluation. The experts reviewed the items for relevance, clarity, and alignment with the WASSCE syllabus and learning objectives related to Microsoft Access. The reliability of the MADAT was ascertained through a pilot test conducted on a cohort of 22 SS II secondary school students from a secondary school located in the Enugu North Local Government Area for urban area and Nkanu-East for rural area, who were excluded from the main sample. Employing the Kuder-Richardson formula (K-R20), an internal consistency coefficient of 0.79 was derived for the MADAT, indicating that the instrument possessed adequate reliability for the purposes of the study. Pre-tests were administered to both experimental and control groups to establish baseline equivalence. The experimental groups were then taught using the Station Rotation Model technique, which involved rotating students through various learning stations, including teacher-led instruction, collaborative group work, and individual computer-based practice. The control groups received instruction through conventional teacher-centered methods. After the intervention, post-tests were administered to both groups to assess the effect of the teaching method on students' achievement in Microsoft Access. The data collected were subjected to analysis using means and standard deviations to address the research inquiries. The hypothesis was tested at a significance level of 0.05, employing the z-test statistic. The following decisions were ruled, that any group with higher mean value irrespective of the closeness to the mean value of the other group would be taken to have done better in achievement test. That is if the probability value is less than or equal to .05 ($p \leq .05$), the null hypothesis is rejected, and If the $p>0.05$, the null hypothesis is not rejected.

Results

1. **Research Question 1:** What is the mean scores of students who were taught Ms Access using the station rotation model and those taught using conventional teaching methods, (Control group)?

Table 1: Mean achievement scores and standard deviations of students taught MsAccess with Station Rotation Model and those taught the same topic using conventional teaching methods

Groups	Number	Pre-test		Post-test		
		Mean ($\bar{x}$)	Standard Deviation (s)	Mean ($\bar{x}$)	Standard Deviation (s)	Mean Gain
Experimental	111	32.10	4.52	50.12	3.11	18.02
Control	102	30.96	4.77	41.65	4.06	10.69
Mean Diff.		**1.14**		**13.47**		

Table 1 presents the mean achievement scores and standard deviations for two groups of students taught Ms Access using different methods: Station Rotation model (experimental group) and lecture method (control group). In the pre-test, both groups had similar mean scores, with the experimental group at 32.10 and the control group at 30. 96 Post-test results showed an improvement in both groups, with the experimental group's mean score increasing to 50.12 and the control groups to 41.65. The mean gain was higher for the experimental group (18.02) compared to the control group (10.69), indicating that Station rational blended Learning led to a greater improvement in student achievement.

Research Question 2; What is the mean score differences in the performance of students in Urban and Rural Senior Secondary Schools students taught Microsoft Access using the conventional methods. (Control group)?

Table 2: Mean score differences in the performance of students in Urban and Rural Senior Secondary Schools students taught Microsoft Access using conventional teaching methods (control group)

Groups	Number	Pre-test		Post-test		Mean Gain
		Mean ($\bar{x}$)	Standard Deviation (s)	Mean ($\bar{x}$)	Standard Deviation (s)	
Urban	55	31.05	3.62	43.65	2.41	12.60
Rural	47	31.26	3.83	36.02	3.17	4.19

Table 2 presents the mean score differences in the performance of the control group of students in Urban and Rural Senior Secondary Schools taught Microsoft Access using the using conventional teaching methods. In the pre-test, both groups had similar mean scores, with the urban group at Urban: 31.05 and Rural: 31.26. In Post-test Urban 43.65 and Rural 36.02.A clear difference in performance emerged after the conventional teaching method was applied. Urban students outperformed rural students significantly, by a margin of 7.63 points. The mean gain was Urban 12.60 Rural 4.76. The urban students gained much more from the instruction compared to their rural counterparts. This sharp contrast suggests that the conventional method of teaching Microsoft Access may be more effective in urban settings

Research Question 3: What is the mean score differences in the performance of students in Urban and Rural Senior Secondary Schools students taught Microsoft Access using the station rotation model. (Experimental group)?

Table 3: Mean score differences in the performance of students in Urban and Rural Senior Secondary Schools students taught Microsoft Access using the station rotation model experimental group.

Groups	Number	Pre-test		Post-test		
		Mean ($\bar{x}$)	Standard Deviation (s)	Mean ($\bar{x}$)	Standard Deviation (s)	Mean Gain
Urban	58	33.54	4.02	52.55	2.86	19.01
Rural	53	30.66	4.18	47.69	3.43	17.03
Mean Diff.		**2.88**			**4.86**	

The table 3 presents the mean achievement scores and standard deviations for Urban and Rural students in the experimental group, both before and after the test. For Urban students (n=58), the pre-test mean was 33.54 (SD = 4.02), which increased to 52.55(SD = 2.86) post-test, indicating a mean gain of 19.01 For Rural students (n=53), the pre-test mean was 30.66 (SD = 4.18), which increased to 47.69 (SD = 3.43) post-test, showing a mean gain of 17.03. The mean difference between Urban and rural students' scores was minimal, at 0.06, suggesting similar improvement across environment.

Hypothesis

Ho_1: There is no significant difference in the mean achievement scores of SS II in both Urban and Rural Senior Secondary Schools students taught Microsoft Access using the station rotation model

Table 4: Summary of z-test analysis of the mean scores of SS II students in both experimental and control groups of students in **Urban and Rural Senior Secondary Schools students taught Microsoft Access using the station rotation model.**

Groups	N	$\bar{x}$	SD	df	p-value	Decision
Urban	58	50.69	2.86	109	0.057433	H_{O1} not rejected
Rural	53	49.55	3.43			

$\alpha = 0.05$,

Table 4 presents a summary of a z-test analysis comparing the mean scores of SS II students in an experimental group of both Urban and Rural. The experimental groups (n of Urban =58 and n of rural =53 total = 111) both had a mean score of 50.69 and 49.55 with a standard deviation of 2.86 and 2.43 respectively. Their p-value is 0.057 while the calculated z= 0.057. The results are statistically not significant, indicating there is no difference in mean scores between the two groups. Thus, the null hypothesis (HO1) is not rejected, suggesting that station rotation model had a significant positive effect on both the Urban and Rural students' performance.

Discussion

The results pertaining to research question one demonstrated a statistically significant disparity in the average gain scores between the two cohorts. Specifically, the experimental group attained a mean gain of 18.02, whereas the control group exhibited a mean gain of 10.69. This outcome indicates that the Station Rotation Model (SRM) of blended learning is ostensibly

more efficacious in augmenting students' proficiency in Microsoft Access relative to the traditional pedagogical approach. The elevated mean gain observed in the experimental group suggests that learners derived greater benefits from the interactive, learner-centric, and adaptable educational milieu promoted by the SRM. These outcomes corroborate prior scholarly investigations that underscore the merits of blended learning frameworks as opposed to conventional instructional methodologies. As articulated by Horn and Staker (2015), the station rotation model fosters active participation, differentiated pedagogy, and optimal utilization of technology, which can markedly enhance educational results. Furthermore, Graham et al. (2013) assert that blended learning modalities, through the integration of face-to-face and digital instruction, offer more individualized and responsive learning experiences, thereby augmenting students' academic success. Additionally, Bazelais (2022) discovered that blended learning settings cultivate student motivation and self-directed learning competencies, which may elucidate the superior performance observed in the experimental group. The employment of technology to facilitate self-directed and collaborative tasks within the SRM enables students to more effectively internalize concepts and apply them in practical contexts — particularly advantageous strategies in computer-oriented disciplines such as Microsoft Access. Conversely, the control group subjected to conventional instructional methods likely experienced more teacher-centered pedagogy, which may inadequately address the diverse learning needs and technological engagement preferences of contemporary learners (Means et al., 2014).

The findings related to research question two revealed a comparable mean achievement score for both urban and rural students instructed in Microsoft Access utilizing the conventional teaching methodology. The results of research question two indicated a significant variance in the academic performance of students from urban and rural senior secondary schools when educated in Microsoft Access through the traditional approach. Urban students attained a higher mean gain, while rural students demonstrated a markedly lower mean gain, signifying a differential gain favoring urban students. This performance disparity implies that students residing in urban locales benefitted more from the conventional instructional methodology. One plausible rationale for this phenomenon is the disparities in access to educational resources, infrastructural facilities, and the quality of teaching personnel between urban and rural educational institutions.

Urban students frequently enjoy superior exposure to computers, electricity, and internet connectivity, which enhances their capacity to engage with computer-based subjects such as Microsoft Access (Adewale&Oyinloye, 2020). Moreover, educators in urban settings may possess greater opportunities for professional development and access to contemporary instructional resources, which contribute to more effective pedagogical practices (Emefa, 2019). In contrast, rural students may encounter challenges stemming from limited digital literacy, insufficient facilities, and minimal exposure to information and communication technology (ICT) tools, which hinder their ability to fully comprehend the practical dimensions of conventional computer instruction (Olamide& James, 2021). These findings are consistent with the observations of Onasanya and Adegbija (2018), which noted that urban students consistently performed better than their rural counterparts in technology-enhanced learning environments due to more favorable learning conditions. Consequently, the results of this investigation underscore the imperative for targeted educational interventions.

The results pertaining to research question 3 and the hypothesis demonstrated a negligible mean score discrepancy of 0.06 between urban and rural students instructed in Microsoft Access through the Station Rotation Model (SRM), with both demographics exhibiting similar advancements. There was no statistically significant difference in the mean achievement scores of SS2 students from urban areas taught Microsoft Access using Station Rotation Model. This nearly uniform performance implies that the SRM possesses the potential to mitigate the educational disparities between urban and rural students by providing equitable learning experiences. The architecture of the SRM, which integrates face-to-face instruction with online and collaborative learning environments, facilitates personalized learning irrespective of geographical location (Horn & Staker, 2015). It enables learners to progress at their own pace, offering assistance as needed and alleviating the effects of contextual inequalities. As posited by Graham et al. (2017), blended learning frameworks such as SRM are conducive to sustained academic improvements by promoting student engagement and adaptability across varying educational contexts. Moreover, the incorporation of technology within the SRM empowers rural students to access instruction and resources of equivalent quality to their urban peers, thus reducing conventional disadvantages such as a scarcity of qualified educators or inadequate infrastructure (Bazelais, 2022). The consistency in performance further substantiates Means et al.'s (2014) assertion that technology-enhanced instruction can improve equity in educational outcomes. In summary, the minimal performance variance corroborates the assertion that the

SRM is efficacious in equalizing educational opportunities for both urban and rural students, particularly in the domain of Information and Communication Technology (ICT) where accessibility and engagement are paramount.

Recommendations

Based on the findings of the study, the following recommendations were made;

1. Schools should adopt the Station Rotation Model to enhance the teaching of technical subjects like Microsoft Access.
2. Teachers should receive professional training on implementing interactive learning models effectively.
3. Policymakers should prioritize funding for technology and resources necessary for effective teaching of Microsoft Access due to its notable significance in this twenty-first century.

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