Konfrontasi Journal: Culture, Economy, and Social Changes
p.ISSN: 1410-881X (Print)
e.ISSN: 2716-2095 (Online)

Barriers to the use of computer-managed instruction in teaching and learning Basic Technology in Anambra State, Nigeria

Chidozie Emeka Alutu
School of education, department of educational foundation and administration, Nwafor Orizu College of Education, Nsugbe
alutu.emeka@nocen.edu.ng

Abstract

The paper identified the factors that hinder the implementation of Computer-Managed Instruction (CMI) in teaching and learning Basic Technology in Anambra State, Nigeria. Consequently, this study utilized a cross-sectional survey design that sampled data from the teachers and students of schools in the state. The study involved 1,092 school students and teachers from 28 public schools in Onitsha Education Zone, providing a diverse sample. Sampling occurred in three stages, resulting in a sample size of 20 teachers and 840 students. Data were collected using a structured questionnaire validated by experts, ensuring reliability. Analysis was conducted using SPSS, ensuring robust interpretation. The study highlighted several constraints such as poor electricity supply, lack of encouragement from the school authorities, technical restraints and limited access to computers. Nevertheless, teachers and students demonstrated a high level of awareness of CMI. Furthermore, no significant differences were observed in the perceptions of barriers between teachers and students. The study underscores the importance of addressing these barriers through collaborative efforts involving stakeholders to facilitate the effective integration of CMI in Basic Technology education. Overcoming these challenges can enhance teaching and learning outcomes, fostering a digitally inclusive educational environment in Anambra State.

Keywords
Computer-managed instruction; Basic Technology; Barriers; Teaching; Learning

I. Introduction

Computer-managed instruction (CMI) in primary education offers a transformative approach to teaching and learning. In primary secondary schools, CMI platforms can be tailored to suit the developmental needs of young learners, providing interactive and engaging educational experiences (Adekunle et al, 2020). One significant benefit of CMI in primary education is its ability to adapt to the diverse learning styles and abilities of young students. Multimedia presentations, educational games, and practical assignments help to address learning styles, as well as to provide multiple chances to achieve success, for all students, which is a strength of CMI (Sharma et al., 2024). This makes learning centred around each individual enhancing the chances of the students to engage fully and experiment with new ideas. Also, CMI supports the learning of basic skills deemed critical in learning and academic achievement processes. For instance, interactive math and language programs help reinforce fundamental concepts, while literacy-focused activities promote reading comprehension and vocabulary development (Dahlan & Wibisono, 2021). By engaging with CMI tools, primary students build a strong educational foundation that prepares them for future learning challenges.

Furthermore, CMI empowers primary teachers by providing valuable insights into student progress and understanding. Teachers are able to monitor the student's results and content mastery and can then predict or pinpoint issues that may cause low performance then address them by offering extra assistance (Shin et al, 2022). Through analysis of the data it becomes easier for the instructors to make important instructional choices which can in turn help the students in their learning process. Reflection on Practice: The use of Computer Managed Instruction (CMI) in the teaching of Basic Technology in Anambra State faces multifaceted challenges. These challenges can be attributed to different factors, including infrastructure constraints, and cultural and attitude-wise barriers (Wu et al, 2021). These are; Overcoming revenue barriers presents different challenges with one of the main challenges being that of inadequate infrastructure. Schools fail to have proper computer laboratories, a stable electricity supply, and internet access, and many students do not have access to personal computers, which are essential for the efficient use of CMI (Callaghan et al, 2018). Due to a shortage of opportunities to access necessary technologies, teachers fail to implement CMI in classroom practices which in turn prevents students from participating in interactional and technology-based learning.

However, one of the challenges is the poor technological skills that teachers possess in their teaching practices. That is why Okeke et al. (2022) Mbayam pointed out that even though there is heightened awareness about digital literacy, many educators in Anambra State's JSS do not possess skills that would allow them to effectively use CMI tools. This lack of competence not only hinders the incorporation of information technology in the curriculum but also discourages the teacher on how best to use CMI as an instructional aid. A lack of access to the latter also contributes to the problem, particularly when technology devices are scarce. A study conducted by Nwaubani et at in Anambra State Jss revealed that many students have no access to computer, Tablet or smartphone in school or at home. This reduced access negates students' possibilities of practicing the use of CMI tool beyond the class, thus continuing to reinforce inequalities, as well as extend the digital divide amongst learners. Another challenge to the implementation of CMI is cultural and attitudinal factors, which act in a similar way to the barriers listed above. Some learners prefer traditional styles of learning compared to the modern technologically based approaches (Baneres et al, 2019). However, there are also some potential hazards specific to CMI that may prevent educators and parents from acceptance of this approach: skepticism and misconceptions regarding the effectiveness of technology in educating may deepen due to the lack of actual actions and examples of its use.

More to that, there is a lot of concern attributed to the fact that the research lacks sufficient funds and institutional backing. Many schools in Anambra State struggle with limited financial resources, making it challenging to invest in technological infrastructure, provide teacher training, and sustain CMI initiatives (Bhalla, 2013). Without adequate support from educational policymakers and administrators, efforts to promote the use of CMI in teaching Basic Technology are undermined. Curriculum constraints also hinder the effective integration of CMI. This inflexibility and the emphasis on the coverage of content and volumetric approach to the assessment of students' achievements may hinder experienced teachers from applying innovative practices such as CMI (Okeke & Ezeudu, 2021). Furthermore, the lack of alignment between CMI tools and curriculum objectives may diminish their perceived relevance and effectiveness in the classroom

The inclusion of Basic technology in Nigeria's School curriculum demonstrates that the country does not want to fall behind. The earlier children are exposed to technology, the better equipped they will be to function in a global society. Having established that technology refers to all human endeavours directed towards the creation and production of things that improve the quality of life. It deserves all of the available attention. The teaching of basic technology using computer-managed instruction will not only make the learning engaging and interactive but will also stimulate logical and critical thinking. It has been proven from literatures that a lot of works have been done on CMI in many countries including Nigeria however, none has been done concerning Schools in Anambra. Anambra currently has a reputation for producing brilliant students, especially in sciences and computer-related subjects. Finding out the availability and impact of using Computer Assisted Instruction in teaching and learning basic technology will be closing the knowledge gap in this area. It can as well open up another area of thought in educational technology. Consequently, the study will focus on the availability and impact of computer-managed instruction in teaching and learning basic technology in schools of Anambra state.

1.1 Cognitivist Theory

The study is based on cognitive theory formulated by Jean Piaget in 1930. This theory explains how the brain works and how it controls the mechanism of language acquisition and gives a notion that anyone out there has to comprehend an idea before he/she can find a way of telling it in language. Piaget's model posits that individuals refine cognitive skills to construct a mental map of the world, affecting learning throughout life (Hopkins-Burke, 2020). Moreover, internal and external influences shape mental processes, impacting learning. CMI aligns with cognitive theory by facilitating active learning and problem-solving, crucial for developing higher-order thinking skills (Yussif, 2023). Loveless (2023) suggests that in CMI, instructional materials should reduce cognitive overload, enhancing comprehension and retention. This intersection of cognitive theory and CMI is pertinent when teaching technology, as it informs instructional strategies to optimize cognitive resources. Effective software selection is crucial, aligning with cognitivist principles of instructional design (Yussif, 2023).

Applying cognitive theory to the topic of barriers to CMI in teaching Basic Technology in Anambra State illuminates potential solutions. Understanding cognitive limitations can inform the design of CMI programs to mitigate barriers. For instance, ensuring instructional materials are presented in manageable amounts reduces cognitive overload (Loveless, 2023). Moreover, integrating active learning and problem-solving activities in CMI aligns with cognitive theory's emphasis on constructing knowledge through experience (Yussif, 2023). By leveraging cognitive theory, educators in Anambra State can design CMI programs that optimize learning experiences and overcome barriers to teaching Basic Technology effectively. The objective of the study therefore is to ascertain the barriers to the use of computer-managed instruction in teaching and learning Basic Technology.

1.2 Research Questions

What are the barriers to the use of computer-managed instruction in teaching and learning Basic Technology?

1.3 Hypotheses

There is no significant difference in the mean responses of teachers and students on barriers to utilizing computer-managed instruction in teaching and learning Basic Technology

II. Research Methods

The study utilized a cross-sectional survey design, a suitable approach for gathering data through questionnaires or interviews from a representative sample. Given the focus on assessing opinions regarding the impact of computer-managed instruction (CMI) on teaching and learning Basic Technology in Anambra State schools, this design facilitated the collection of relevant data from teachers and students in selected government junior secondary schools. Conducted in Onitsha Education Zone, encompassing Onitsha North, Onitsha South, and Ogbaru local government areas, the study examined the impact of CMI within a diverse demographic of Igbo-speaking professionals and residents. With its blend of rural and urban features, this zone offered insights into teaching and learning practices applicable to various educational contexts within Anambra State.

The population comprised 1,092 junior secondary school students and teachers across 28 public schools in Onitsha Education Zone. This encompassed students and educators from different local government areas, providing a diverse sample for the study. Sampling occurred in three stages, involving a random selection of 20 schools, Basic Technology teachers, and students across basic levels. The sample size consisted of 20 teachers and 840 students, reflecting the diverse demographics of the zone's schools. A structured questionnaire titled 'Impact of Computer-Managed Instruction in Teaching and Learning Basic Technology in Schools Questionnaire' (ICMITLBTJSSQ) was used to gather data. This questionnaire featured sections on demographic information and CMI impact, utilizing Likert scales to gauge respondents' perceptions.

The questionnaire underwent validation by experts, ensuring its relevance and clarity. Reliability was confirmed through a test-retest method, achieving a coefficient of 0.88, indicating strong consistency in responses. These measures ensured the instrument's effectiveness in gathering reliable data. The researcher, assisted by research assistants, administered questionnaires over a one-month period. Responses were collected, collated, and analyzed using Mean, Standard Deviation, chi-square, and Statistical Product and Service Solution software (SPSS, version 20), ensuring robust data analysis and interpretation.

III. Results and Discussion

3.1 Results

Table 1. Demographic Characteristics of Teachers

Item	Frequency	Percentage (%)
Gender		
Male	8	44.4
Female	10	55.6
Class		
JSS1	6	33.3
JSS2	7	38.9

JSS3	5	27.8
Teaching Experience		
Less than 5 years	6	33.3
6-10 years	8	44.4
More than 10 years	4	22.2
Awareness of CMI		
Yes	18	100.0
No	0	0.0

Table 1 presents the demographic characteristics of teachers participating in the study. Out of 18 respondents, 44.4% were male, while 55.6% were female. Regarding teaching experience, 33.3% had less than 5 years, 44.4% had 6-10 years, and 22.2% had more than 10 years. In terms of class, 33.3% taught JSS1, 38.9% taught JSS2, and 27.8% taught JSS3. Notably, all teachers (100.0%) were aware of computer-managed instruction (CMI), indicating a high level of awareness and potential engagement with technology-enhanced teaching methods among participants.

Table 2. Demographic Characteristics of Students

	Frequency	Percentage (%)
Gender		
Male	406	50.1
Female	404	49.9
Class		
JSS1	225	27.8
JSS2	387	47.8
JSS3	198	24.4
Awareness of CMI		
Yes	819	100.0
No	0	0.0

Table 2 displays the demographic characteristics of students involved in the study. Among the 819 respondents, 50.1% were male, and 49.9% were female, indicating a nearly equal gender distribution. Concerning class distribution, 27.8% were in JSS1, 47.8% in JSS2, and 24.4% in JSS3, demonstrating a varied representation across junior secondary school levels. Notably, all students (100.0%) were aware of computer-managed instruction (CMI), highlighting a high level of familiarity with technology-enhanced learning methods among the student population.

Table 3. Barriers to using computer technology in learning Basic Technology

S/N	Items	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
		F (%)	F (%)	F (%)	F (%)	F (%)

1	Lack of adequate power supply	318(38.4)	269(32.5)	132(15.9)	41 (5.0)	68 (8.2)
2	Lack of encouragement by the school authority	234(28.3)	118 (14.3)	104 (12.6)	150(18.1)	222(26.8)
3	Lack of alternative power source (solar, generators, etc)	233(28.1)	150 (18.1)	57 (6.9)	143(17.3)	245(29.6)
4	Lack of awareness of computer technology for teaching and learning Basic Tech	179(21.6)	192 (23.2)	124 (15.0)	74 (8.9)	259(31.3)
5	Technical difficulties when using computers	215(26.0)	224 (27.1)	140 (16.9)	58 (7.0)	191(23.1)
6	Insufficient computer tools (e.g., educational software, internet access)	123(14.9)	338 (40.8)	160 (19.4)	64 (7.7)	
7	Teachers lack the skills for using computer technology	89 (10.7)	188 (22.7)	136 (16.4)	276(33.3)	139(16.8)
8	Students are not interested in learning with computer technologies	81 (9.8)	114 (13.8)	27 (3.3)	172(20.8)	434(52.4)
9	Teachers are not interested in teaching with computer technologies	62 (7.5)	70 (8.5)	107 (12.9)	170(12.9)	419(50.6)

10	Parents do not co-operate with teachers to use computer technologies for the students.	97 (11.7)	85(10.3)	238 (28.7)	29 (3.5)	379(45.8)

Table 3 outlines the perceived barriers to using computer technology in learning Basic Technology, as reported by respondents. Lack of adequate power supply emerged as the most prevalent barrier, with 38.4% strongly agreeing and 32.5% agreeing, indicating a significant concern among participants. Similarly, the lack of encouragement by school authorities was identified as a notable barrier, with 28.3% strongly agreeing and 14.3% agreeing. Furthermore, the absence of alternative power sources, such as solar or generators, was highlighted as a substantial obstacle, with 28.1% strongly agreeing and 18.1% agreeing. This suggests that addressing power-related issues is crucial for the effective integration of computer technology in education.

Moreover, a considerable portion of respondents expressed concerns about technical difficulties when using computers, with 26.0% strongly agreeing and 27.1% agreeing. This indicates that overcoming technical challenges is essential for ensuring smooth implementation of computer-assisted learning. Interestingly, while a significant proportion of respondents acknowledged insufficient computer tools (14.9% strongly agree, 40.8% agree), there was a relatively lower agreement regarding teachers' lack of skills for using computer technology (10.7% strongly agree, 22.7% agree). This suggests that while resource availability is a concern, addressing teachers' skills and training may also be vital for effective implementation.

Additionally, issues related to student and teacher interest in using computer technologies were highlighted, with notable proportions disagreeing with statements indicating lack of interest. However, challenges related to parental cooperation with teachers to use computer technologies for students emerged as a significant concern, with 28.7% strongly agreeing and 45.8% strongly disagreeing. Overall, the findings underscore the multifaceted nature of barriers to using computer technology in learning Basic Technology, emphasizing the importance of addressing infrastructure, support, training, and stakeholder cooperation to promote effective integration of technology in education.

Table 4. Mean Comparison of teachers and students on barriers to utilizing computer-managed instruction in the teaching and learning Basic Technology

S/No	Item	Mean score of Teachers	Mean score of Students	T value	P value	Remarks
1	Lack of adequate power supply	1.94 ±1.00	1.12±1.22	0.62	.533	Not significant
2	Lack of encouragement by the school authority	1.83±1.62	1.01±1.59	0.75	.461	Not significant
3	Lack of alternative power source (solar, generators,	1.78±1.59	1.03±1.63	0.47	.635	Not significant

	etc)					
4	Lack of awareness of computer technology for teaching and learning Basic Tech	1.00±1.64	1.05±1.56	0.46	.646	Not significant
5	Technical difficulties when using computers	2.89±1.57	2.75±1.50	0.63	.524	Not significant
6	Insufficient computer tools (e.g., educational software, internet access)	2.33±1.29	2.20±1.69	0.65	.522	Not significant
7	Teachers lack the skills for using computer technology	1.44±1.38	1.22±1.27	0.13	.889	Not significant
8	Students are not interested in learning with computer technologies	2.28±1.27	2.92±1.12	0.13	.896	Not significant
9	Teachers are not interested in teaching with computer technologies	2.97±1.28	2.97±2.83	0.42	.673	Not significant
10	Parents do not co-operate with teachers to use computer technologies for the students.	2.83±1.54	2.60±1.43	0.40	.691	Not significant

Table 4 presents the mean comparison of teachers and students on barriers to utilizing computer-managed instruction (CMI) in teaching and learning Basic Technology. Each item's mean score for both teachers and students is provided, along with the T-value and P-value. The T-values and P-values indicate whether there are significant differences between the mean scores of teachers and students for each barrier. A P-value greater than 0.05 suggests that there is no significant difference between the mean scores of teachers and students, leading to the conclusion that the hypothesis is not supported, and the differences observed are likely due to chance. In this case, all P-values are above 0.05, indicating that the mean scores of teachers and students on each barrier are not significantly different. Therefore, the hypothesis that there are differences between the perceptions of teachers and students regarding barriers to utilizing CMI in teaching and learning Basic Technology is not supported.

3.2 Discussion of results

The study involved a total of 18 teachers (55.6% males and 44.4% females) and 810 students (50.1% males and 49.9% females). The results of the tables indicate that the study achieved a well-balanced representation of both male and female participants among students and teachers. There were more teachers and students of JSS2 classes, suggesting a potential inclination or exposure to CMI within this particular class. Furthermore, a majority of the teachers possessed teaching experience ranging from 6 to 10 years, potentially indicating a heightened interest in CMI within this specific group. Further finding shows that all the teachers and students were aware of computer-managed instruction. This is in conformity with Madudili (2020)where it stated that the adoption of ICT (Information and Communication Technologies) in teaching and learning processes has led to the use of computers and other technological gadgets for curriculum content delivery in Nigeria. Hence, acknowledging the awareness of the CMI in the schools. This finding agrees that there is a very high awareness level of CMI among teachers and students of Basic Technology in secondary schools will make a profound impact in teaching and learning.

Teaching and learning basic technology faced significant challenges in Nigeria. Furthermore, Madudili (2020) pointed out that the top three factors impeding the use of computer technology in the classroom are a lack of alternative power sources, a lack of encouragement from school administrators, and inadequate funding for the education sector. The study also showed that inadequate computer tools provide additional challenges, and that the key obstacle to teaching and learning basic technology is a need for more understanding of computer technology. This understanding is in line with Mohammed, Auwal and Muhammad (2022) who stated that computer education plays a critical role in determining pupils' technical literacy and future opportunities. They went further to state that the program provides individuals with fundamental skills necessary for the contemporary digital era and prepares them for careers as proficient computer scientists or information technicians. The study however, stated that there are still issues, which include, costly equipment and software, inadequate infrastructure, a lack of skilled workers, a dearth of software that is appropriate for different societies, and restricted internet access.

IV. Conclusion

In conclusion, this study provides understanding into the barriers hindering the effective utilization of computer-managed instruction (CMI) in teaching and learning Basic Technology in Anambra State. Through a comprehensive analysis of data gathered from teachers and students, several key findings have emerged. Firstly, the study identified various barriers, including inadequate power supply, lack of encouragement from school authorities, technical difficulties, and insufficient computer tools. These barriers represent multifaceted challenges that impact the successful implementation of CMI in educational settings. Furthermore, the comparison of perceptions between teachers and students revealed no significant differences in their views on these barriers. This highlights the importance of acknowledging and addressing common challenges faced by both educators and learners in leveraging technology for teaching and learning Basic Technology. On the whole, these results led to the identification of various difficulties that limit the integration of CMI in educational practice and the need for cross-disciplinary collaboration to address them. Stakeholders such as school authorities, teachers, students and parents need to embark on

joint exercises that would foster an appropriate environment that allows efficient use of technologies in education.

References

Adekunle, S. E., Adepoju, S. A., Suleiman, G., & Abdullahi, M. B. (2020). Effectiveness of Computer-Managed Instruction on Students' Performance in Tertiary Institutions. In ICT-Based Assessment, Methods, and Programs in Tertiary Education (pp. 278-295). IGI Global.

Baneres, D., Whitelock, D., Ras, E., Karadeniz, A., Guerrero-Roldán, A. E., & Rodríguez, M. E. (2019). Technology enhanced learning or learning driven by technology. International journal of educational technology in higher education, 16(5), 26-40.

Bhalla, J. (2013). Computer use by school teachers in teaching-learning process. Journal of education and training studies, 1(2), 174-185.

Callaghan, M. N., Long, J. J., Van Es, E. A., Reich, S. M., & Rutherford, T. (2018). How teachers integrate a math computer game: Professional development use, teaching practices, and student achievement. Journal of Computer Assisted Learning, 34(1), 10-19.

Dahlan, J. A., & Wibisono, Y. (2021). The Effect of Hands-On and Computer-Based Learning Activities on Conceptual Understanding and Mathematical Reasoning. International Journal of Instruction, 14(1), 143-160.

Hopkins Burke, R. (2020). Cognitive learning theories. In An Introduction to Criminological Theory (pp. 115–119). https://doi.org/10.4324/9780203118283-40

Loveless, B. (2023). Cognitive Load Theory – The Definitive Guide.EdTech Magazine

Madudili, G. C. (2020). Assessment of the impact of computer assisted instruction on teaching and learning in Nigeria: A theoretical viewpoint Yunusa Dangara Usman Federal Road Safety Corps, Nigeria. International Journal of Education and Development Using Information and Communication Technology (IJEDICT), 16(2), 259–271.

Mohammed, A; Auwal, M. T; Muhammad, H. (2022). Computer Education in Nigerian Secondary Schools : Problems Computer Education in Nigerian Secondary Schools : Problems and Prospects. December 2021.

Munoz Ubando, L. A., Amigud, A., & Sirazitdinova, E. (2024). Computer simulation and hands-on labs: A case study of teaching robotics and AI. International Journal of Mechanical Engineering Education, 03064190241240416.

Nwaubani, O. O., Okafor, O. S., & Onyeanusi, O. C. (2014). Teachers' perception of the effectiveness of computer-assisted-instruction in the teaching of junior secondary school social studies in Nnewi Education Zone, Anambra State, Nigeria. Journal of Education and Practice, 5(29), 155-164.

Okeke, N. U., Anene, N. A., & Agu, N. A. (2022). Assessment of over-schooling and social skills as determinants of academic achievement among selected private owned secondary schools in Anambra State-Nigeria. Academic Journal of Current Research, 9(3), 19-27.

Shin, J., Chen, F., Lu, C., & Bulut, O. (2022). Analyzing students' performance in computerized formative assessments to optimize teachers' test administration decisions using deep learning frameworks. Journal of Computers in Education, 9(1), 71-91.

Wu, W., Berestova, A., Lobuteva, A., & Stroiteleva, N. (2021). An Intelligent Computer System for Assessing Student Performance. International Journal of Emerging Technologies in Learning, 16(2).

Yussif. (2023). Cognitive learning theory in the classroom. Retrieved from https://classroommanagementexpert.com/blog/cognitive-learning-theory-in-the-classroom