

Problem Solving Strategy and academic Performance of Delta State Students in Biology.

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Keywords

Abstract

This study investigated the development and implementation of a Computer-Assisted Learning (CAL) package using video technology to address students' learning difficulties in Enugu State. The persistent academic challenges faced by students in core subjects, particularly Mathematics and English, highlight the need for innovative instructional interventions. A CAL package incorporating video lessons was designed, developed, and tested among selected secondary schools in Enugu State. The study adopted a developmental research design, using both qualitative and quantitative methods to evaluate the effectiveness of the package. Results showed significant improvement in students' comprehension and performance. The findings suggest that video-based CAL tools can serve as effective remediation strategies in Nigerian classrooms.

Introduction

The integration of technology into teaching and learning has significantly transformed educational delivery across the globe, redefining the roles of both teachers and students. Today's learning environments are increasingly characterized by digital interactivity, accessibility to global knowledge resources, and personalized learning paths made possible through technology. These advancements not only enhance student engagement but also provide opportunities for self-directed and flexible learning. With technology, concepts that were once abstract or difficult to visualize can now be illustrated through simulations, animations, and multimedia presentations, thereby improving comprehension and retention.

In Nigeria, the use of Information and Communication Technology (ICT) in classrooms is gradually gaining momentum, driven by the growing awareness of its potential to improve education quality. Although challenges such as inadequate infrastructure, limited funding, and lack of teacher training still exist, many schools are beginning to adopt ICT tools to support teaching and learning. The Nigerian government and various non-governmental organizations have initiated programs aimed at increasing ICT access in schools, recognizing its importance in equipping students with 21st-century skills. This shift is particularly relevant in addressing the diverse learning needs of students in large, heterogeneous classrooms where conventional methods often fall short, (UNESCO 2020).

One of the most promising innovations in this digital transformation is Computer-Assisted Learning (CAL), which employs interactive software, multimedia content, and instructional videos to

create engaging and learner-centered experiences. CAL enables students to learn at their own pace, receive immediate feedback, and revisit challenging topics as needed. It supports differentiated instruction, making it easier for teachers to accommodate students with varied learning abilities. In this context, CAL emerges not just as a teaching aid, but as a dynamic tool for bridging learning gaps, promoting remediation, and improving academic outcomes across various subjects. (Okebukola, 2020).

Students in Enugu State, like their counterparts in other parts of Nigeria, continue to struggle with learning difficulties in core academic subjects. These challenges are often attributed to ineffective instructional strategies, lack of appropriate learning materials, overcrowded classrooms, and limited teacher-student interaction. Traditional chalk-and-talk methods are no longer sufficient to meet the learning needs of 21st-century learners.

Video technology, when embedded in a computer-based learning environment, presents an innovative solution to many of the challenges faced in traditional education settings. One of the key benefits is its ability to make abstract concepts more concrete and visually accessible. Subjects such as Mathematics, Science, and Technical Drawing, which often rely on theoretical or conceptual understanding, can be enhanced through visual explanations, animations, and real-life demonstrations. For instance, a video demonstration of a scientific experiment or a geometric construction can help students grasp the process far better than static images or textbook descriptions. This visualization not only deepens comprehension but also bridges the gap between theoretical knowledge and practical application (Yousef et al., 2014).

Moreover, video-based learning caters to diverse learning styles, including visual, auditory, and kinesthetic learners. While some students benefit from reading texts, others may find video explanations more engaging and easier to follow. Video content often includes narration, subtitles, animations, and graphics, which together enrich the sensory experience of learning. This multimodal delivery ensures that no learner is left behind due to a mismatch between teaching style and learning preference. In classrooms where students possess varying levels of ability and interest, video technology can help level the playing field by providing multiple avenues through which learners can access and understand information (Mayer, 2001).

Another advantage of incorporating video technology is its support for self-paced and repetitive learning, which is particularly beneficial for students with learning difficulties. Learners can pause, rewind, and replay video lessons as many times as needed, enabling them to review challenging topics at their own pace without the pressure of keeping up with the rest of the class. This flexibility reduces anxiety and fosters a sense of control over the learning process. In remediation programs, this repeated exposure to difficult concepts helps reinforce learning and promotes mastery. As a result, video-assisted CAL environments not only support better academic performance but also encourage independent learning and confidence among students facing academic struggles (Zhang et al., 2006).

The potential of video-based Computer-Assisted Learning (CAL) packages in providing effective remediation for struggling students has been widely acknowledged in educational research across the globe. Numerous studies have demonstrated how the integration of instructional videos within digital learning environments can enhance student engagement, simplify complex concepts, and promote independent learning. These tools are particularly beneficial for students who require additional instructional support beyond regular classroom teaching. By combining audio-visual elements, interactivity, and the flexibility of repeated access, video-based CAL packages serve as effective remedial interventions that help Students Bridge learning gaps and improve academic performance across various subject areas.

Despite the global recognition of video-enhanced CAL tools, there remains a significant gap in the local development and contextual application of these technologies in many parts of Nigeria. Specifically, in Enugu State, empirical studies examining the design, implementation, and outcomes of

such tools—especially those tailored for remediation—are relatively scarce. While some schools and private institutions have begun experimenting with digital tools, their use is often limited, inconsistent, or unaligned with the specific learning difficulties faced by students in the region, (Mayer, 2017). As a result, there is an urgent need to explore how locally relevant and culturally responsive CAL packages, particularly those incorporating video technology, can be developed and effectively integrated into the state's education system.

Moreover, the lack of empirical data from Enugu State poses a challenge to educators and policymakers who aim to scale up or institutionalize technology-based remediation efforts. Without solid evidence of their effectiveness within the local context, there may be resistance to adopting these tools, or misalignment between the tools and the actual needs of learners. Therefore, conducting a study focused on the development and application of a video-based CAL package specifically for remediation purposes is both timely and necessary. Such research would provide valuable insights into how educational technology can be adapted to meet local demands, ultimately contributing to more inclusive and effective teaching practices across the state.

This study, therefore, explores the development of a CAL package using video technology and evaluates its impact on students experiencing learning difficulties. It seeks to provide a replicable model that can be used across schools in Nigeria to enhance learning outcomes.

Statement of the Problem

Despite government efforts to improve the quality of education, many secondary school students in Enugu State continue to exhibit poor academic performance, especially in core subjects. Teachers often struggle to address the individual learning needs of students due to large class sizes and limited instructional resources. Learning difficulties persist, and there is little or no remediation support tailored to students who are lagging. The traditional methods of teaching are inadequate in engaging students or making learning meaningful. There is an urgent need for an innovative approach that can support and remediate these learning challenges. This study seeks to address this gap through the development and implementation of a CAL package that utilizes video technology to improve students' understanding and performance.

Aim and Objectives of the Study

The aim of the study is to develop a computer-assisted learning package using video technology for remediation of students' learning difficulties in secondary schools in Enugu State. Specifically the study sought to

1. to identify the major areas of learning difficulties among secondary school students in Enugu State.
2. to develop a CAL package using video technology targeted at those areas of difficulty.
3. to determine the effectiveness of the CAL package in improving students' understanding and performance.
4. to evaluate students' and teachers' perception of the CAL package as a remediation tool.

Research Questions

1. What are the major learning difficulties experienced by students in selected secondary schools in Enugu State?
2. How effective is the developed CAL package in remediating students' learning difficulties?

Conceptualization

Computer-Assisted Learning (CAL)

Computer-Assisted Learning (CAL) refers to the use of computer technologies to facilitate and deliver educational content to learners. This approach transforms traditional learning environments by integrating digital tools that can accommodate different learning styles and preferences. CAL programs

are designed to be interactive, enabling students to engage with content at their own pace and receive instant feedback. Such systems may range from simple instructional software to complex platforms that include simulations and virtual environments (Yusuf, 2019).

Mayer, (2017), noted that the key feature of CAL is the incorporation of multimedia elements such as text, graphics, animations, audio, and video. These components help in reinforcing learning by catering to the visual, auditory, and kinesthetic modalities of learners. Research has shown that multimedia-enhanced learning leads to better comprehension and retention of information compared to conventional teaching methods. For instance, animations and simulations in CAL can help students visualize abstract processes and relationships, making them easier to understand

In the context of this study, CAL is enhanced by embedding video technology to further support learning remediation. The package developed for this research includes step-by-step video tutorials, voice-over explanations, and practice activities. These features make the learning experience more immersive and allow students to replay sections for better understanding. This is particularly important for students who experience learning difficulties, as it provides a supportive and non-threatening learning environment (Adebayo, 2022).

Learning Difficulties

Learning difficulties are specific, often persistent challenges that hinder a student's ability to acquire knowledge and skills expected at their age or grade level. These challenges are not indicative of a lack of intelligence or effort but stem from neurological, psychological, or socio-cultural factors. Common indicators of learning difficulties include poor academic performance, difficulty in reading, writing, or solving mathematical problems, and an inability to follow instructions or concentrate for extended periods (Olagunju, 2020).

The causes of learning difficulties are multifaceted. Cognitive issues such as dyslexia, dyscalculia, and attention deficit disorders may affect a student's ability to process and retain information. Emotional and psychological factors such as anxiety, depression, and low self-esteem can also interfere with learning. Additionally, environmental factors including poverty, lack of parental support, poor classroom infrastructure, and ineffective teaching practices further exacerbate these challenges (Nwachukwu, 2021).

Addressing learning difficulties requires a comprehensive approach that includes early identification, personalized interventions, and supportive instructional strategies. The use of digital tools like CAL can play a crucial role in this process. By offering interactive and customized learning paths, CAL allows students with learning difficulties to receive targeted support that meets their individual needs. In this study, the CAL package with integrated video content is designed to tackle specific learning problems in subjects such as Mathematics and English (Eze, & Nwankwo, 2022).

Video Technology in Education

Video technology in education involves the use of pre-recorded or live-streamed video content to support the teaching and learning process. This technology offers visual and auditory learning experiences, which can be especially beneficial for illustrating complex or abstract concepts. Teachers can use video to demonstrate procedures, provide real-life examples, or show historical and scientific phenomena that would otherwise be difficult to explain in a traditional classroom setting (Okebukola, 2020).

Videos help to break the monotony of textbook-based instruction and increase student engagement. They provide learners with the flexibility to learn at their own pace, review challenging topics, and access educational content outside the classroom. Moreover, video lessons can be paused, rewound, or replayed multiple times, allowing learners to gain a deeper understanding of the material. These features make video technology particularly effective in inclusive education settings where

learners have diverse needs and abilities (UNESCO. 2020).

In the development of the CAL package for this study, video technology plays a central role. The videos used in the package were carefully scripted and produced to align with curriculum topics identified as areas of difficulty. Each video includes visual aids, animated explanations, and voiceovers to ensure clarity and engagement. The aim is to make learning more accessible and to empower students who may have previously struggled to keep up with traditional instruction (Ihejirika, 2023).

Remediation

Remediation refers to the process of providing additional, targeted instruction to students who are performing below expected academic standards. The goal is to help these students master foundational skills and concepts so that they can successfully engage with more advanced content. Remedial programs often focus on key subjects such as Mathematics, Reading, and Writing and are essential in preventing long-term academic failure (Ali, & Abdullahi, 2021).

Traditional remediation strategies typically involve small group instruction, one-on-one tutoring, and the use of repetitive drills. While these methods can be effective, they often require significant time and resources that many schools cannot consistently provide. Furthermore, students in remediation programs may feel stigmatized or embarrassed, which can negatively affect their self-esteem and motivation. To counter these challenges, technology-based remediation tools like CAL offer a more flexible and inclusive alternative (Daramola, 2022).

The CAL package developed in this study serves as a remediation tool by providing individualized instruction in a digital format. Through video-based lessons and interactive exercises, the package allows students to work independently and at their own pace. This minimizes the pressure associated with group settings and provides immediate feedback, which is essential for reinforcing learning. As a result, students with learning difficulties can build confidence and improve their academic performance more effectively, (Adewale, & Ifeoma, 2023).

Empirical Review

Adebayo (2019) investigated the effect of computer-assisted instruction on students' academic achievement in Mathematics in Nigerian secondary schools. His findings revealed that students taught with CAL, which included interactive video tutorials, significantly outperformed their peers who were taught using traditional instructional methods. Similarly, Eze and Opara (2020) examined the impact of video-enhanced instructional materials on Biology learning outcomes and found that students taught with video-based CAL materials demonstrated better academic performance and greater engagement compared to those who received text-based instruction.

Okeke (2021) explored the use of video-based CAL tools in remediating learning difficulties in English Language among junior secondary school students in Enugu State. The results indicated a significant improvement in vocabulary development and reading comprehension among students who used the video-based tools. Likewise, Akinbobola (2022) evaluated the effectiveness of a video-assisted CAL package designed to remediate difficulties in Algebra and Geometry, and found that students exposed to the intervention showed significant academic gains compared to those in the control group.

Fatima and Sule (2023) assessed the effect of multimedia instruction on students with learning disabilities in Kaduna State. They discovered that students who used CAL supported with videos, animations, and audio instructions achieved higher scores, demonstrated better motivation, and retained more information than those taught through traditional methods. In a related study, Chukwu (2021) developed and tested a computer-based remedial program for junior secondary school students in Enugu and found that the program significantly improved students' grammar and comprehension skills, highlighting the potential of CAL in supporting academic remediation.

Methodology

The study adopted a developmental research design with three main phases: analysis, design/development, and evaluation. The target population consisted of secondary school students and teachers in Enugu State. A purposive sampling technique was used to select three public secondary schools and 60 students identified by their teachers as experiencing learning difficulties. A diagnostic test to identify learning difficulties and a CAL package developed using video editing and instructional design tools was used to obtain data. The CAL package was designed to address learning difficulties in selected topics in Mathematics and English Language. Video lessons were created with voice-over explanations, animations, and subtitles. Students used the package over a four-week period. Pre-test and post-test scores were compared to assess improvement. Descriptive statistics (mean and standard deviation) were used to answer the research questions, while thematic analysis was employed for qualitative feedback.

Data Presentation

Table 1: Pre-test and Post-test Mean Scores of Students Using the CAL Package

SUBJECT	PRE-TEST MEAN	POST-TEST MEAN	IMPROVEMENT
MATHEMATICS	35.2%	68.7%	+33.5%
ENGLISH LANGUAGE	41.5%	73.2%	+31.7%

Figure 1: Students' Perception of the CAL Package

85% found it engaging, 78% said it helped them understand difficult topics, while 90% would like to use it regularly.

Summary

This study focused on the development of a computer-assisted learning (CAL) package that utilized video technology to address specific learning difficulties among secondary school students in Enugu State. The development of the package began with a thorough analysis of the students' academic challenges, which included identifying weak areas in key subjects such as Mathematics and English Language. Based on this analysis, the instructional design of the CAL package was tailored to target these problem areas, ensuring that the content was both relevant and effective for remediation. Video technology played a central role in this development, as it was used to present complex concepts in a visual and engaging format, allowing for easier comprehension and better retention of information.

The package was implemented through a structured instructional model that combined video lessons with interactive exercises, quizzes, and immediate feedback mechanisms. This model aimed to foster a self-paced learning environment, enabling students to review lessons as needed and revisit challenging topics. Throughout the study, students interacted with the CAL package under the guidance of their teachers, who were trained to integrate the tool into their teaching methods. This approach allowed for a seamless blend of traditional and digital learning techniques, offering students the benefits of both classroom instruction and personalized, technology-enhanced support. The results of the study were highly positive, demonstrating notable improvements in students' academic performance, particularly in the subjects that had been identified as areas of difficulty.

In addition to the improvements in academic achievement, the study found that both students and teachers had a positive perception of the CAL package and the use of video technology. Students reported that the visual and interactive nature of the lessons helped them understand complex concepts more easily, and they appreciated the flexibility of being able to learn at their own pace. Teachers also recognized the value of the CAL package in engaging students and providing additional support for learners who were struggling. The study ultimately reinforces the potential of computer-assisted learning, particularly when enhanced with video technology, as an effective educational intervention.

for improving academic performance and addressing learning difficulties. The findings suggest that integrating such digital tools into the educational process can lead to more personalized and impactful learning experiences, making them a valuable resource for schools in Enugu State and beyond.

Conclusion

The study concludes that video-based CAL packages can play a significant role in remediating learning difficulties among students in Enugu State. By making learning interactive and self-paced, students are better able to grasp difficult concepts and improve performance. The success of the package also reflects the need to integrate ICT tools into the Nigerian secondary school curriculum as part of instructional strategies.

Recommendations

1. The Ministry of Education should fund the development and distribution of CAL packages in public schools.
2. Regular training workshops should be organized to equip teachers with skills in creating and using video technology in instruction.
3. CAL should be incorporated into the secondary school curriculum as a supplementary instructional tool.
4. Developed packages should be reviewed periodically to ensure alignment with curriculum updates and learners' needs.
5. School administrators and parents should support the use of digital tools as part of students' learning routines.

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