



INFLUENCE OF ELECTRONIC AND NON-ELECTRONIC INSTRUCTIONAL MATERIALS ON SECONDARY SCHOOLS TEACHERS INTEREST AND STUDENTS LEARNING OUTCOMES IN KOGI STATE, NIGERIA

BY

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Abstract.

Generally, educational institutions like secondary schools leverage instructional materials to stimulate, simplify and concretize teaching-learning processes. Recently, two forms of instructional materials have been identified in assisting teachers to improve understanding of the subjects taught to the students including visual and audio-visual aids; and could be concrete and non-concrete materials. Other forms of instructional materials are powered by electricity (electronic instructional materials (EIM)) and not powered by electricity (non-electronic instructional materials [NEIM]). The paper investigates the influences of teachers' adoption of electronic or non-electronic-based instructional materials and their associated learning outcomes on learners. The sample size of 120 students was selected randomly from the total population of 200 students in three secondary schools in Ankpa, Kogi State, Nigeria to participate in performance test composed of 10 items, and 3-multiple option questions. It was found that students had slightly higher post-test mean interests and acceptance score (4.17) when compared to their counterparts not exposed to EIM (that is, NEIM) at 1.50. While the mean rating value of reveals that students taught using EIM had post-test mean gender achievement score of 4.17 while the mean achievement score of students taught with NEIM method was 2.00. Again, students taught using EIM performed better than their counterparts taught using NEIM by mean rating value of 4.38 to 1.93.

Keywords: Electronic, non-electronic, instructional materials, teaching, learner, teachers,



Introduction

The need for high-standard instructional materials to support academic activities in schools is apt (Bukoye, 2019). In fact, studies have highlighted the problem of non-availability of commercially viable and research-enabled instructional materials especially in science education (Lee et al., 2019; Rey et al., 2019). Electronic devices and Information Communication Technologies (ICT) have gradually been introduced into educational contexts (such as instructional videos) over the past 2 decades (Exposito et al., 2020). The mobile technology continues to lead this learning technology by enabling individual with exceptional computing powers such as laptops, personal digital assistants (PDAs), tablet personal computers (PCs), cell phones, and e-book readers (Exposito et al., 2020; Hollander et al., 2022). This large amount of computing power and portability, combined with wireless communication (Sadler et al., 2020) and context sensitivity tools, makes one-to-one computing a learning tool of great potential in both traditional classrooms and outdoor informal learning (Sung et al., 2016). Though, adequacy of instructional materials is key to ensuring their effective use for didactic education. Nevertheless, the use of few available instructional materials has efficaciously boosted teaching and learning as well as other activities within the cycle (Bukoye, 2019; Rasheed et al., 2022; Gonzalez & Deal, 2017). Teachers need not justify their ineffective use of instructional materials based on scantiness of instructional aids. Increasingly, ICT has been applied successfully in instruction, learning, and assessment. ICT is considered a powerful tool for educational change and reform (Maulida, 2022). One important dimension in teacher education is mastering the use of instructional materials during class sessions (Bukoye, 2019).

Instructional materials are those materials used by a teacher to simplify their teaching (Gonzalez & Deal, 2022) often regarded as learning support (Richards & Pun, 2021). They include both visual and audio-visual aids and could either be concrete or non-concrete, in which case could impact on the effectiveness of classroom instructions (Banilower, 2019). The use of instructional materials in the classroom has the potential to help the teacher explain new concepts clearly, resulting in better student understanding of the concepts being taught. However, they are not ending in themselves but, they are means to an end (Sharil et al., 2021; Menke & Paesani, 2018). Teachers are trained in the concept, design, and use of instructional materials in attaining stated learning objectives (Kurniaman, 2019), which include learning resources such as electronic and non-electronic resources. However, it is not clear how teachers are to apply these learning resources in attaining the stated objectives, and the learning outcomes of utilizing these resources (Alenezi, 2020). This paper evaluates the effect of electronic and non-



electronic instructional materials on teachers' interest and students' learning outcomes among secondary schools in Kogi State, Nigeria.

Forms of Instructional Materials

Instructional materials have been defined by various authors as didactic materials or things which are supposed to make learning and teaching possible. Also, it is described as concrete or physical objects which provide sound, visual or both to the sense organs during teaching (Rasheed et al., 2022; Abdalla, 2017). These facilitate the process of teaching social skills, self-care skills, and cognitive concepts (Cagiltay et al., 2019). Elementary and high school education, besides knowledge acquisition, is founded upon developing students' intellectual capabilities, individual decision making as well as developing their abilities for additional improvements. High quality extracurricular content contains good graphic quality and understandable multimedia contents (text, sound, image, video, animation, simulations, computer games, etc.). Extracurricular content must be connected and adjusted with the content of the educational institution. ICT unify concepts of education and technologies into one (Maulida, 2022; Cagiltay et al., 2019; Juniantari et al., 2019; Klement et al., 2014). Education assisted by electronic learning directly affects the students' behavior. Software used during lectures can be designed in various colors. Based on such display of information, both brain hemispheres are triggered, and a student can remember and accept new information in an easier way. Practical lectures have shown that children who follow lectures designed on basis of multimedia content accept new information in easier and faster ways in comparison to children who learn by means of a traditional method of learning with books (Rey et al., 2019; Tandika, 2020). For decades, educators have underscored the importance of learning materials in addressing challenges of insufficient learning outcomes and uninspiring learning environments. Empirically, children demonstrate better outcomes in reading, executive functions, and fine motor skills when subjected to appropriate materials. The environment, especially the prepared environment, is one of a child's atypical educators (Alenezi, 2020; Tandika, 2020).

Instructional materials (teaching aids or educational media) are a piece of equipment used by teachers or students to assist them in delivering lessons in the classroom. There are three categories of teaching aids: electronic teaching aids, non-electronic teaching aids (Richards & Pun, 2021; Sharil et al., 2021). Electronic learning materials can be characterized as fully electronic, hypertext interactive learning materials, created for the purpose of the implementation of the learning situations. They are designed to allow easy orientation in a curriculum, primarily using hyperlink text layout and use of a wide range of multimedia elements, which



are intended to stimulate as many components of the student's perception as possible (Mammadova, 2022). Electronic learning materials contain not only the text, but elements that are able to draw attention to important terms; and continuously motivate the learner and retain attention through pictures, videos, sound recordings, etc. (Shavkatovna & Sharifovna, 2022). According to the adoption of videos and multimedia as pedagogical tools, it will strengthen theory and application in the teaching-learning environment because of the cognitive, psychological, and knowledge visualization advantages (Nacak et al., 2020).

Non-electronic learning materials bring life to learning by stimulating students to learn. The use of instructional materials in the classroom has the potential to help the teachers to explain new concepts clearly, resulting in better student understanding of the concepts being taught (Rasheed et al., 2022). However, good teaching resources can never replace the teacher, but the teacher uses them to achieve their teaching and learning objectives. Some of the instructional materials necessary for effective teaching and learning of subjects include the chalkboard, models, graphs, charts, maps, pictures, diagrams, cartoons, etc. They could either be concrete or non-concrete (Tuimur & Chemwei, 2015). The global COVID-19 pandemic further reassured the use of online learning technologies with accompanying instructional materials such as system thinking tools (computational simulation) through spreadsheets, information and media literacy platforms, which targeted towards Next Generation Science Standards (Sadler et al., 2020; Sevimli-Celik, 2020). Though, evidence has revealed that instructional materials are formed by teachers from diverse materials and sources; thereby denting their coherence, and quality in supporting teaching and learning (Banilower, 2018).

Non-Electronic Instructional Materials. These are the earliest teaching materials used by teachers in schools. Most educational regulators recommended using teaching and learning materials in printed materials as guidelines for teaching aids such as fiction and non-fiction books and periodicals materials such as newspapers (Sharil et al., 2021). In addition, non-electronic instructional materials are usually visual in nature without the need for electrical power including visual aids chalkboard, science textbooks, charts, model, specimen, practical farm or school gardens, survey equipment, simple farm tools, farm machinery and implement, cages for small animals (rabbit and poultry), feeding trough, samples of different soils, etc. These can be classified into printed and reference materials, and graphic materials. The inclusion of the right content in curriculum is intended to revive the disconnect between practice and theory, which make teaching and learning process more powerful, meaningful and impactful (Sevimli-Celik, 2020). The delivery of material and knowledge contents of the curriculum by teachers are carried out either



as written or verbal accounts in the spirit of lesson plans for enriched engagements with learners (Puttick et al., 2020).

Electronic Instructional Materials. These refer to media that utilize electrical sources. These teaching materials are increasingly popular among teachers because they are simple and attract students. These include radio, television, computers, Liquid Crystal Display (LCD) projectors, Digital Video Disc (DVD) player, and Compact Disc (CD) (Sharil et al., 2021). Likewise, the audio-visual aids, which learners can hear and see, by producing sound that are expressed in thoughts [31]. Others appeal to learners' senses of ear and eyes such as video, tapes, television, projectors and motion pictures (Maulida, 2022; Abdalla, 2017; Mammadova, 2022). The main classes of electronic instructional materials include Projected materials television, video tape, overhead projector, slides and slide projector and transparencies. Audio and other visual materials: Radio, model, computer, and tape recording. Computer Assisted Instruction (CAI) is a computer system that can deliver teaching directly to students by interacting with the subjects programmed into the system. The computer system presents a series of teaching programs to students in the form of information and practice questions (Maulida, 2022).

CAI generally refers to all educational software that is accessed via computers where students can interact quickly, precisely and efficiently. CAI uses computers as learning machines to present various kinds of lessons that have their own characteristics to achieve educational goals. CAI as a learning method that uses computers to teach students, where the computer contains teaching materials designed to teach, as a learning resource, and as a tool for evaluating student learning skills to the desired level of skills that should be mastered (Sidiq et al., 2021; Syakur et al., 2020). The rise of augmented reality platforms has improved on video-assisted instruction because it makes it possible to overlay 3-D objects into textbooks to appreciate and acquire high-levels of motor skills and learning goals especially in physical sporting activities (Chang et al., 2019). There are efforts to present content to learners through the online platforms in forms of tutorial to simplify understanding of learning content in self-regulated style (Tatminingsih et al., 2021).

Research Questions. This paper investigates the following research questions:

1. What is the influence on the use of electronic and non-electronic instructional materials on learners by teachers?
2. What is the level of acceptance or interest on the use of electronic and non-electronic instructional materials adopted by teachers?



3. What are the differences in the teaching and learning outcomes with the use of electronics compared to non-electronic instructional materials adopted by teachers?

Research Methodology

The quasi-experimental research approach (Chang et al., 2019) was adopted as drawn from theoretical frameworks of Walker (1982), and Jarolimek et al. (1993) on instructional materials influence of electronic and non-electronic instructional materials on learning outcomes of students. The research design is reliable for investigating the effect, interest to use and effectiveness of electronic and non-electronic instructional materials for teaching and learning among teachers and students learning outcomes among secondary schools in Ankpa, Kogi State, Nigeria. The performance test containing six items and 3-multiple options were administered on the experimental and control groups in separate classes. The purposive sampling technique enabled the selection of co-educational secondary schools in Ankpa, Kogi State, Nigeria possessing similar attributes (that is, presence of properly equipped laboratory, presence of pre-service teachers and permanent teachers with minimum teaching qualifications. Finally, treatment was randomly assigned to each intact class in which one is experimental class and the other is the control class. The random sampling technique was utilized to draw the required two small groups. The sample size of 120 (60%) is selected from the total population of 200 students in three secondary schools in Ankpa, Kogi State, Nigeria.

The research instrument will be served on both groups in the selected schools. The research questionnaire sections, and its items. The instrument's reliability was determined using the split-half method which is drawn on 60 respondents. Each item was scored independently for both even and odd numbers, which generated Cronbach Alpha level of significance of 0.943 Alpha level of significance, and confirmed to be sufficient reliable (Bukoye, 2019). This study involved two groups of subjects – the experimental group (taught with electronic instructional materials - EIM) and the control group (taught with non-electronic instructional material - NEIM). The researchers sent letters of request to three selected secondary schools for permission to carry out the study with participants. EIM and NEIM groups were taught the content of the respiratory system for six weeks. Prior to the experiment, the test instruments – Biology Achievement Test on Respiratory System (BATRS) and Biology Interest Scale (BIS) (Onu et al., 2022) were administered as pre-test to all the students in the sampled schools. After this, both the groups were taught the respiratory system for a period of six weeks. At the end of the lessons, the post-test was administered to the students. Thereafter, the interest test was administered on



the students. The data gathered was analyzed using the mean rating for the purpose of rejecting or accepting the ideas provided in each of the questionnaire items (Kidd et al., 2020). The mean difference and Pearson correlation coefficient were used to analyze the hypotheses (Pekdag et al., 2020). The larger mean value of the item is accepted or otherwise rejected. To this point, the Likert five-point rating scale was adopted in which the respondents' responses and their assigned numerical values are represented as follows: Strongly Agree – SA(5), Agree – A(4), Undecided – U(3), Disagree – D(2), and Strongly Disagree – SD(1). , the mean is $\frac{15}{5} = 3.0$, which is the cut-off point for the questionnaire item to be accepted or otherwise rejected.

Results

Research Questions and their Responses

The respondents' answers to various research questions posed by the researchers are presented and analyzed as follows:

Research Question 1. What are the learning effects on the use of instructional materials on learners by student teachers?

Table 2.

The mean of gender of learners' achievement in Biology is exposed to EIM and NIEM.

Group	SA	A	U	D	SD	Total	Mean	Remarks
NEIM								
Pretest	0	5	11	23	21	60	2.00	Rejected
EIM								
Post-test	14	42	4	0	0	60	4.17	Accepted

From Table 2, the mean rating value of reveal that students taught biology using EIM had post-test mean achievement score of 4.17 while the mean achievement score of students taught with NEIM method was 2.00. Students taught biology using audio-visual aided instruction thus performed better than their counterparts taught biology using NEIM.

Research Question 2. What is the level of acceptance and interest on the use of instructional materials adopted by student teachers?

**Table 4.**

The mean level of acceptance and interests of learners are exposed to EIM and NIEM.

Group	SA	A	U	D	SD	Total	Mean	Remarks
NEIM								
Pretest	0	2	3	18	37	60	1.50	Rejected
EIM								
Post-test	14	42	4	0	0	60	4.17	Accepted

From Table 4, the mean rating value revealed a post-test mean interest and acceptance score of 4.17 for students taught Biology using the EIM at 1.50. Therefore, students had slightly higher post-test mean interests and acceptance score when compared to their counterparts in Biology not exposed to EIM (that is, NEIM).

Research Question 3. What are the differences in the use of electronics compared to non-electronic instructional materials on teaching and learning outcomes as adopted by student teachers?

Table 5.

The mean level of acceptance and interests of learners are exposed to EIM and NIEM.

Group	SA	A	U	D	SD	Total	Mean	Remarks
NEIM								
Pretest	1	6	5	24	24	60	1.93	Rejected
EIM								
Post-test	27	29	4	0	0	60	4.38	Accepted

From Table 5, the mean rating value reveals that students taught biology using EIM had post-test mean achievement score of 4.38 while the mean achievement score of students taught with NEIM method was 1.93. Students taught biology using audio-visual aided instruction thus performed better than their counterparts taught Biology using NEIM.



Discussion

These participants' responses agree with previous studies on learners' achievements with electronic and non-electronic instructional materials adopted for teaching and learning in secondary schools (Onu et al., 2022; Sayan & Mertoglu, 2020). According to Onu et al. (2022), the AVA has the potential of making students learn more by easily stimulating and sustaining students' interests. Sayan et al. (2020) stated that instructional equipment and materials are indispensable facilitators for efficient and effective teaching. It helps and guides teachers in effective ways too. Also, the augmented reality-assisted instructions can provide better learning outcomes with learning activation and motor skills development in learners (Chang et al., 2019; Cloonan & Fingeret, 2020; Safilullah et al., 2021; Bremholm & Skott, 2019).

Conclusion

The paper investigated the effects of deploying electronic and non-electronic instructional materials in secondary schools in Nigeria. It was found that all kinds of teachers utilize these innovative technologies in boosting learners' learning achievements. Again, the utilization of electronic and non-electronic instructional materials has great impacts on students' performance among senior secondary schools. It can be concluded that electronic instructional materials had higher effects when compared to non-electronic instructional materials utilized for teaching and learning activities. Therefore, electronic instructional materials have significant effect on students' performances because of their capability to simplify and clarify complex and difficult concepts by teachers.

Recommendations

1. Future works can measure the learning outcomes during summative or formative tests activities using EIMs and NEIMs at secondary school level.
2. Again, curriculum planning and design must consider support available instruction materials.

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