

EFFECTIVENESS USE OF INSTRUCTIONAL MATERIALS IN TEACHING AND LEARNING OF COMPUTER SCIENCE IN COLLEGES OF EDUCATION

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Abstract: This research work investigated the effectiveness use of instructional materials in teaching and learning of computer science in colleges of education. A two group pre-test post-test quasi-experimental design was adopted for the study. One research question and one hypothesis were formulated to guide the study. A total of 100 students were selected from two (2) Colleges of Education Borno State through simple random sampling and stratified random sampling techniques. Fifty students (Experimental group) were taught with instructional materials and another fifty (Control group) were taught without instructional materials. A validated Computer Achievement Test (CAT) was used to gather data for the study and a split-half was carried out using the Pearson product moment correlation to obtain a reliability coefficient of 0.67. Independent t-test was used to test the hypothesis at 0.05 significant level while the Pearson product moment correlation coefficient at that level was used to analyse the research question. The study revealed that students who taught with instructional materials performed significantly better than those taught without instructional materials and also that the use of instructional materials generally improved students' understanding of concepts and led to high academic achievements. Recommendations were made on how to improve academic performance of Computer students by encouraging the use of instructional materials in teaching-learning Computer.

Keywords: Instructional Materials, Teaching-Learning.

1. INTRODUCTION

Instructional materials serve as a channel between the teacher and the students in delivering instructions. They may also serve as the motivation on the teaching-learning process. It is use to get the attention of the students and eliminate boredom. Instructional materials are highly important for teaching; especially for inexperienced teachers. Teachers rely on instructional materials in every aspect of teaching. They need material for background information on the subject they are teaching.

Over the years, Nigeria has embarked on a scientific, industrial and technological take-off. The national policy on education (FRW 2004) can only be attained if Nigerian citizens are properly equipped with necessary knowledge and skills offered in Computer Science by the use of adequate instructional materials in teaching/learning.

Computer has continued to play significant role in the development of any society. Indeed computer is a basic tool in realizing the nation's scientific and technological aspirations. According to Attach (2003) computer is an electronic and automatic machine that accepts data through the central processing units. It has been seen as a factor in the development and understanding of any society or nation since the world is a global village. Computer is taught to people to enable them think creatively and constructively in computer terms and to apply it in the analysis of data.

Today, mysteries of nature cannot be understood without the knowledge of computer. In spite of the important place of computer in our educational system, students in schools continually register fair performances (Obodo 2002). According to Betiku (2002) the fair performance may be due to methodology of teaching, attitude of teachers or lack of interest by students. Having seen the important of computer as an inevitable tool for human and technological development, it is necessary to look into the use of instructional materials for effective teaching and learning. The understanding mostly in schools, Obodo (2004) mentioned many reasons abound why there is need to advocate for the use of instructional materials. Policy makers on the other hand see it as the way to simulate and maintain interest of students while in classes. Because of these conflicting views on the use of instructional materials for effective teaching and learning of Computer Science associated, following its overwhelming important as attested by various authors and philosophers in the background, we therefore consider it necessary to conduct a survey on the effectiveness use of instructional materials in teaching/learning of Computer Science in Colleges of Educations.

Statement of the Problem:

The transmission of facts, ideas and information from the teacher to the students in a systematic order or procedure is referred to as teaching. During this process instructional material otherwise known as teaching aids meant to make instruction more meaningful, clear and much more interesting to students are brought in display. There is a general impression that science education is not achieving the desired objectives especially with high incidence of students' poor performance in Computer and other science courses at Colleges of Education. This situation has assumed a precarious dimension in all Colleges Education in Borno State and particularly in College of Education Waka-Biu. The failure of educational system to provide adequate and appropriate teaching-learning aids in order to improve academic performance of students is of a great concern to government, educational institutions and other concern citizens. It is believed that if adequate instructional materials are made available to schools and are used appropriately in teaching-learning process, a better performance could be achieved. Hence, the motivation of this study which seeks to find out the effectiveness use of instructional materials in teaching and learning of computer science in colleges of education.

PURPOSE OF THE STUDY

The purpose of this study is to:

1. Find out the effectiveness use of instructional materials in teaching and learning of computer science in colleges of education.
2. Compare the performance of two sets of students in which one of the groups is taught with instructional materials and other without instructional materials (Experimental and Control group respectively).

Research Questions

In the course of this research work, the following question was raised:

1. To what extent do students taught with instructional materials perform higher than those taught without instructional materials?

Hypothesis

H₀: There is no statistical significant relationship between the academic performance of computer students and the use of instructional materials in teaching-learning.

Significant of the Study

1. Steer Government and Ministry of Education to recognize the need to adequately equip the schools with current and appropriate instructional materials.
2. Inculcate in teachers the habits of using instructional materials appropriately in teaching-learning process to arouse interest and determination among students.
3. Prove the worth of instructional materials in teaching and learning processes.

2. CONCEPTUALISATION

The concept of instructional materials referred to as instructional aides have gone beyond simple aids, instructional technology and media to communication and educational technology. According to Olawale (2013) instructional materials include materials used to facilitate learning for better results. In the same vein, Uzuegbu, Mbadiwe and Anulobi (2013) refer to instructional materials as any device used to assist the instructor in the preparation of a lesson, teaching of the lesson and facilitate students' learning of the subject matter. They include those subjects that are commercially acquired or improvised by the teacher to make conceptual abstraction more concrete and practical to the learner (Iwu, Ijioma, Onoja and Nzewuihe, 2011). These are relevant materials utilized by the teacher during instructional proceeds for the purpose of making the contents of the instructions more practical and less vague. Instructional materials are also described as concrete or physical object which provide sound, visual or both to the sense organs during teaching (Agina-Obu, 2005). Thus, instructional materials could be regarded as the information dissemination devices used in the classroom for easy transfer of learning. They provide first-hand experience where possible or of vicarious one where only that is feasible. The instructional materials as the name suggests, are materials of visual audio and audio visual category that helps to make concepts abstracts and ideas concrete in the teaching/learning process (Fafunwa,2010).They are also materials which the teacher uses in supplementing his teaching (Adeniyi, 2011). Instructional materials include materials used to facilitate learning for better results. Likewise, it is the use of the chalkboard, charts, models, overhead projectors, films, television and computers in teaching process (Federal Republic of Nigeria, 2004 revised). Hence, it is not just the use of tools of technology alone but a systematic, integrated organization of machines, hardware, software and other facilities to the solution of problems in education. In order to ensure an effective teaching learning process, it is important for the teacher to be thoroughly acquainted with the teaching resources and services available to him. The components of instructional materials available to teachers and students are in large numbers and also very according to the functions of each of them. Pictures (motion and still) graphics, maps, radio-recording and play back and the equipment used to get some of these utilized can be regarded as the components of Audio-visual Aids, or Instructional Aids. Examples, of instructional materials are charts, maps, diagrams, comics, models, globes, slides, film trips, television, radio, cassettes, video, recorders, cinemas, public address system, laboratories and museums, flash cards, flannel boards, card boards, calendars, computers, etc. More so, instructional materials are devices and schemes which aid instruction. Everything which the teacher uses in instruction is called instructional materials or teaching aids. These materials can be real or substitutes but have a common goal. They hasten in the transfer of knowledge, skill and values from the teacher to the learners in the teaching-learning process. Instructional materials help bring students face to face with the world which education intends to introduce to them.

The Significance of Instructional Materials

Many educationists agree that instructional materials bring about improvement in the teaching/learning process as well as permit teachers and students to interact as human beings in a climate where people control their environment for their own best purposes (Aniayewu, 2010).

Also, most educators generally and equally agree that the creative use of variety of instructional materials will increase the probability that student would learn more, return better and bring about the skills they are expected to perform (Adewoyin,2011). Apart from their ability to process meaningful sources of information, instructional materials help the teacher with the means of extending his horizon of experience as well as providing the teacher with rich sources of procuring communicative materials which could be produced jointly by the teacher and the students (Osalusi, 2012). Furthermore, several researches have been conducted to test the value of instructional materials and other sensory devices. These researches here proved that instructional materials when properly used in teaching learning situations can accomplish a lot of complex tasks (Lowenstein, 2012). The instructional materials also offer real experiences in giving the teacher basis for thinking and understanding. They supply concrete basis for conceptual thinking and therefore reduce meaningless responses of students (Ismail & Aleem, 2013). At the same time, they overcome the limitations of time, space and size by helping the students to understand things that are too small or too big, or too slow or too fast (Adeniyi, 2011).

Therefore, instructional materials can provide members of a group with a common or joint experience. The break language barriers and ease difficulties and in the end make the lesson more meaningful. They save time and thus enable

students grasp ideals more effectively and faster. Likewise, they help to simplify and emphasize facts and clarify difficulties.

They reinforce other teaching methods and materials. They improve the efficiency of other method and effectiveness of teaching process.

However, before a teacher selects his instructional materials, he should consider the following which will serve as his criteria for selection.

a. **Relevance:** As much as possible, teachers should make sure that the Instructional Materials so selected can be used to achieve the objective of the particular lesson. It is wrong for a teacher to bring irrelevant tools into the class for teaching-learning process. In this case, the instructional materials cannot be relied upon to achieve the objective of the lesson.

Care must be taken to ensure that only instructional materials that relate to the topic are used while teaching.

b. **Cost:** The instructional materials should be within the reach of the teacher or the school. The cost of the instructional materials will determine whether it can be bought and used or not; otherwise the teacher selects only that instructional material that costs less. In an event of the inability of the school and age limit. It is wrong to bring into the class instructional materials that cannot be easily used to convey meaning of facts, ideas and concept to the students because of the limit of the learner. A primary one school child may not be interested in a lesson in which difficult software is used to present facts. This means instructional materials are not just selected on the basis of their attractiveness but on the basis of certain criteria that will ensure their effectiveness in the teaching and learning processes.

Importance and Uses of Instructional Materials

According to Bajah, (2002) the followings were some of the reasons for using instructional materials:

- i. A good instructional material can supplement spoken or written words.
- ii. It can bring teaching to life in a way which word cannot.
- iii. Words can describe people, places and objects but a picture immediately brings reality.
- iv. A teaching aid can simplify and clarify what is complex and difficult to express in words.
- v. Instructional materials have motivational value for them to develop the interest of the student.
- vi. Instructional materials can also promote retention as we can understand from the Chinese proverb that says “what I hear I forget, what I see I remember, what I do, I understand”.
- vii. They save time, and energy what you will explain in ten minutes, will be possible in less time with the use of instructional materials.

3. MATERIALS AND METHODS

The researchers adopted a quasi-experimental design for this study. A total of one hundred (100) students were sampled from two Colleges of Education using random sampling technique and a stratified random sampling technique was used to select the two colleges in order to have a true representative sample. The number of boys to girls was in the ratio of 1:1 which reflect gender equality. The simple random sampling technique was used in selecting students to avoid prejudice and give room for effective students- materials interaction and adequate class room management.

The researchers prepared two different lesson notes which were used to teach the students. There were two groups; the experimental group was taught with instructional materials but the control group was taught without instructional materials. The same topic “Basic Logic Gates” was used for both groups. At the end of the lesson, the researcher administered a Computer Achievement Test (CAT) to the students in the two groups. The Computer Achievement Test comprised ten (10) multiple choice items and each question has four options with one correct answer. And each correct answer was scored two marks. The researchers experience a difference in performance of pre and post-test analysis in the two groups. The instruments were first validated by computer education experts and the reliability of the Computer Achievement Test (CAT) was determined using Pearson product moment correlation for split-half to obtain a reliability coefficient of 0.67.

The purpose of this research was explained to the students. In testing the performance of experimental and control groups on a pre-test, pre-test based on the topic to be taught was administered to the students. The pre-test was followed immediately by teaching the two groups of students on the topic “Basic logic gates and Combined logic gates”; one group with instructional materials and the other without instructional materials. The researcher made sure that the students in the two groups passed their scripts after both Tests giving a return rate of 100%. During the Pre-Test and Post-Test examination, the same examination condition were enforced in the two groups. This was done so as to obtain reliable and valid results from the two groups. To assured confidentiality and avoid prejudice, the students were asked not to write their full names. The scores of students in both pre-test and post-test were transformed into group data and the frequency of students’ performance computed. The independent t-test statistic was employed to analyse the two groups, (one was taught with instructional materials and the other without instructional materials). The Pearson product Moment Correlation (PPMC) and independent t-test were used for data analyses. The hypothesis and research question were tested at 0.05 alpha levels significance. The mean scores and the standard deviation of the two groups were also computed.

4. RESULTS

Hypothesis (H₀)

There is no significant relationship between the academic performance of computer students and the use of instructional materials in Teaching-learning. The analysis in Table 1 shows that the calculated t-value (5.42) is greater than the critical value (1.98) at 0.05 alpha significant levels. Therefore, the null hypothesis is rejected. This implies that there is a statistical significant relationship between the academic performance of computer students and the use of instructional materials in Teaching-learning.

Research Question 1

To what extent do students taught with instructional materials perform higher than those taught without instructional materials?

The analysis in Table 1 shows that the calculated r-value (0.61) is greater than the critical value (0.273) at 0.05 alpha significant levels and the standard deviation and mean of students taught with instructional materials are greater than students taught without instructional materials. The result shows that the performance of experimental group is better than the control group.

5. DISCUSSION OF THE RESULT

The findings in the research hypothesis showed that there is a statistical relationship between the academic performances of computer students and the use of instructional materials in teaching-learning.

The result agrees with the findings of Inyang (1997) that teaching is effective when the teacher make use of instructional materials. (Lance et al, 1999; Todd & Kuklthau, 2004) confirmed a significant correlation between the presence and the use of library materials by the students and teachers with better performance. Similarly, (Todd & Kuklthau, 2005, p.82.) found a simple correlation between the students inputs and better academic achievement. Analysis shows that the availability and the use of chalkboard, math kit, teaching guide, science guide, audio-visual aids and the use of science kit have positive impact on the academic performance for science students. The concept of instructional materials revolves on the fact that, it does not only stimulate the learner, but enhances learning outcome generally, increased relationship and recall by involving the relevant senses and makes instruction clear, meaningful and in most cases real. Also Emma & Ajayi (2004) asserted that “teaching equipment and materials have change over the years, not only facilitate teaching-learning situation but also address the instructional needs of individuals and groups.” Okendu (2012) asserted that regular instructional supervision has a significant bearing on students’ academic performance. He also, affirmed that adequate supply of instructional resources have significant effect on students’ academic performance. Onasanya & Omosewo (2011) confirmed that both standard and improvised instructional materials have the same positive effects on students’ academic performance

Table 1: Independent t-test and Pearson product moment correlation analysis of students taught with instructional materials and those taught without instructional materials

GROUP OF STUDENTS	N	X	Y	SDx	SDy	r _{cal}	r _{cri}	df	T _{cal}	t _{cri}	Decision at p = 0.05
Students taught with instructional materials(x)	50	52.26		9.95		0.61	0.273	98	5.42	1.98	
students taught without instructional materials (y)	50		29.02		8.47						

Significant at $p < 0.05$

The results of research question one implied that the performance of experimental group is better and higher than the control group. This is in agreement with the concept that if learning is to be achieved positively then the laboratory should be seen as a workshop for a range of students' activities, including experimental investigation to confirmatory exercise and skills learning. The results are in accordance with Inyang (1997) views that students learn faster through activity oriented instruction and when students are not actively involved in the learning process, performance becomes poor. This is not farfetched from the fact that instructional materials are very important in teaching learning process if learning outcomes are to be achieved with relative ease. Jimoh, M.F. (2009) emphasized that advances in technology have brought instructional materials especially the projected and electronic materials to the forefront as the more radical tools of globalization and social development which have affected class teaching-learning situation positively. Such technological breakthroughs as networked and non-networked projected and non-projected, visual, audio, audio-visual electronic material is important landmark in knowledge transfer and high academic performance. Also, Aguisiobo (1998) expressed that learning is an activity that take place in a contact and not in a vacuum. He reiterated that students with teaching aids do not have a blank mind but a consolidated and developed library of knowledge. Omosewo (2008) ascertained that in a modern science curriculum programme, students need to be encouraged to learn not only through their eyes, or ears, but should be able to use their hands to manipulate equipment.

6. CONCLUSION

In this study the aim was to examine the effectiveness of instructional materials (teaching aids) in teaching and learning of Computer Science, it is hereby concluded that;

1. The students taught with instructional materials perform better and higher than those taught without instructional materials
2. There is a statistical relationship between the academic performance of computer students and the use of instructional materials in teaching-learning.

7. RECOMMENDATIONS

Based on the results of the study the following recommendations are made:

1. The teachers should encourage active student's participation in class work by adopting instructional materials interactions.
2. Workshops, seminars, conferences or orientation courses on chemistry should be designed to acquaint the teachers with the latest development in the field of Computer.
3. Well-equipped computer laboratories should be established in all the schools.

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