



An assessment of methods of teaching Computer Science courses to Science students in Colleges of Education to ascertain the extent to which digital tools are integrated into science classroom

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KEYWORDS

Teaching methods, digital tools, computer science, technology integration

ABSTRACT

The study assessed the methods of teaching computer science courses to school of science students in Colleges of Education in Anambra State. The study aims to ascertain the extent to which computer science educators make use of digital tools such as simulation software, data analysis tools, and interactive platforms, to enhance the learning experience of science students. The research methodology used in this study is a descriptive survey which involves students and educators of the colleges of education in Anambra State, observation of classroom practices and analysis of course materials which helped in the gathering of data on the extent of digital tools integration in the teaching and learning of computer science courses in science classrooms. Preliminary findings suggest that there are indeed available digital tools meant to improve teaching and learning of computer science courses in science classrooms, but the implementation is yet to meet the desired expectations. This is largely due to limited educators' training, lack of specific guidelines, and lack of adequate funding by the government. The study recommends adequate training for computer science educators, provision of effective learning environment for science students, and providing guidelines for the use of digital tools in teaching Computer Science courses to science students.

1. Introduction

Education is an instrument of excellence for effective national development. It therefore remained a social process in capacity building and maintenance of society. According to Ayo (2011), Education is the process through which individuals are made functional members of the society through transmission of knowledge, skills and attitude. Education is an important sector which can be fun with any serious country, state, organization or individual and that is why an individual, organization or government uses every means to make sure a good education is provided for its citizens. One of the means of this provision is the introduction of computer science in colleges of Education as a course of study. Right from time immemorial computation and computerization has had a significant role in the education system. According to Abonyi and Ernest (2014), Computers are machines that capture data at the source, record the data, prepare it, perform processing requirements and communicate the result of the operation when required. Thus, computer science is the study of the design and use of computer systems. One goal of the computer science department is to provide the student with the tools to identify those problems that are best solved by means of a computer and to design and implement effective economical, and creative solutions. Computer science as an academic discipline systematically includes three domains: Theory, abstraction, and design. The curriculum's required courses give the students a strong foundation in both the software and hardware aspects of computing, as well as the mathematics and science that underline the discipline. Computer science education is of paramount importance to the nation's development and it is on this premise that the federal government of Nigeria sought to introduce computer studies in the education system from primary to higher institutions Damkor, Danjuma & Haruna (2015). In line with this, NPE (2004)

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has clearly explained that Nigeria cannot afford to ignore the role which computer literacy plays in achieving the national goals of technological development, considering the fact that educational systems around the world face formidable challenges that taxing conventional strategies. Hence, Nigeria has resolved to introduce computer education in primary and secondary schools. There is a need to produce professional teachers in the discipline, although there has been provision for the training of computer scientists in the universities and polytechnics, but little attention was paid to the training of teachers in the computer education (NCCE, 2012).

This study intends to investigate the methods of teaching computer courses to science students in colleges of education in Anambra State. Assimonye (2017) pointed out the innovative and individualized methods of teaching which includes: Team teaching, computer assisted instruction, simulation, programmed instruction etc. According to research on teaching methods in STEM subjects (Science, Technology, Engineering, Mathematics) and empirically studied teaching Methods, the following 20 teaching methods by Zandler and Klautdt (2015), could be selected for teaching computer science courses: simulation, concept-mapping, direct instruction, discovery learning, experiment, case study, jigsaw, programmed instruction, Leittext method, learning tasks, learning by teaching, models method, role-play, method, problem-based learning, project method, presentation, reciprocal teaching, learning stations, and web quest thus, methodology is very vital in every teaching and learning situation.

Types of Assessment

Mba & Udegbe (2013), stated the 4 major types of assessment as follows:

Formative assessment is used in monitoring the progress of learning during instruction. It is used to identify student's ability in order to guide them towards the desired objectives on continuous basis.

Summative assessment focuses on the overall effective of a programme. It is used to determine the extent to which the instructional objectives have been achieved.

Diagnostic assessment is used to find out students persistent or reoccurring learning difficulties that are left unresolved by the corrective prescription of formative test.

Placement assessment seeks to find out the relevant previous knowledge of students who are to be exposed to a subsequent instruction. It seeks to find out whether the entering new students have the pre-requisite skills that will be suitable for their pursuance of a particular programme.

Teaching Method

According to Obioha (2013), teaching method is a distinct acceptable process of teaching of inculcating the subject matter into the learners, in a formal school system. Mustafa (2019), defined Teaching methods as the methods, tools, and devices through which it has to be possible to assess, apply, plan the educational process, and provide the students with knowledge in order to reach the educational goals. In addition to improving the performance of the teacher, teaching methods can help the students to develop their capabilities, increase their level of understanding, and save their effort and time.

As Written by Dr. Kris MacDonald and reviewed by EducationCorner.com Team (2022), every single teacher needs a variety of different teaching methods in their theoretical teaching bag to pull from depending on the lesson, the students, and things as seemingly minute as the time, the class and the subject.

Science Student

A science student is a person formally engaged in learning of science courses, especially one enrolled in a school or college. Science student or graduate can be called a scientist, which is defined as a scholar who specializes in the academic study of science courses. Scientists typically work on the theoretical and practical side of science.

Concept of College of Education

College of education is an institution where teachers are trained. Colleges were established in the immediate post-colonial period to combat the dearth of qualified teachers in the primary schools (Oga 2021). Since then, many of them have been established in most parts of the country both by the state and Federal Governments.

The programme is a three-year course open to candidates who had completed a Grade II Teachers' course or secondary education with required credit passes. Until the establishment of the National Commission for Colleges of Education (NCCE) in Nigeria in 1989, all the Advanced Teachers' Training Colleges and Colleges of Education in Nigeria numbering about 43, were affiliates of institutes/faculties of education in Nigerian Universities. Today, there are 57 Colleges of Education in Nigeria with uniform minimum standards as provided by the National Commission for Colleges of Education (NCCE).

Methods of Teaching Computer Courses

The term teaching method refers to the general principles, pedagogy and management strategies used for classroom instruction. According to Jahnke & et al (2020), Teachers' choices of teaching method of teaching computer courses depend on what fits the subject areas, educational philosophy of computing, classroom demographic, available facilities and schools' mission statement. Some of the methods of teaching computer courses are as follows:

Participatory Teaching Methods

According to Zendler and Kaudt (2015), some of the participatory teaching methods includes: Concept-mapping, CAI, computer simulation, direct instruction, discovery learning, experiment, case study, jigsaw, programmed instruction, Leittext method, learning tasks, learning by teaching etc.

Computer Assisted Instruction (CAI)

Computer-assisted instruction (CAI) is an interactive instructional technique whereby a computer is used to present the instructional material and monitor the learning that takes place. It uses a combination of text, graphics, sound and video in enhancing the learning process. It provides multimedia that helps to understand difficult concepts through multi-sensory approach and allow students to proceed at their own pace (self-pacing). CAI programs use tutorials, drill and practice, simulation, and problem solving approaches to present topics, and they test the student's understanding. According to Okoye and Agbo (2018), CAI can improve student's motivation.

Computer Simulation

Computer simulation is defined as a computer model of a real or theoretical system that contains information on how the system behaves and how experimentation can take place i.e. changing the input to the model that affects the output. As a numerical model of a system, presented for a learner to manipulate and explore, simulations can provide a rich learning experience for the student. According to Atabhtor (2020), they can be a powerful resource for teaching: providing access to environments which may otherwise be too dangerous, or impractical due to size or time constraints and facilitating visualization of dynamic or complex behavior. Sitzmann (2011), also discovered that gaming simulations increased post-training self-efficacy, declarative knowledge, procedural knowledge, and retention. Thus, the most positive outcomes of simulation in teaching computer courses occurred when students were actively involved.

Direct Instruction DI/ Discussion

This is a systematic model of teaching focusing on a sequenced and incremental mastery of curriculum-based competence and a capacity to apply generalizable skills to tackle other similar

questions/problems (Adams & Engelmann, 1996). DI is implemented through carefully planned lessons in which students are provided with substantial, and yet gradually reduced, guidance. To ensure high-quality instructional interactions for students of all skill levels, DI involves careful and flexible differentiation of students in lessons that are appropriate to their current instructional needs. Hence, the implementation of DI has to be controlled and standardized in order to minimize student misinterpretation and maximize instructional effects (Barbash, 2011)

Jigsaw Method

According to Hilimaiah (2019), Jigsaw is a cooperative learning strategy that enables each student of a "home" group to specialize in one aspect of a topic (for example, one group studies computer networks another group studies operating system). Students meet with members from other groups who are assigned the same aspect, and after mastering the material, return to the "home" group and teach the material to their group members.

Team teaching

Team teaching is a group of two or more teachers working together to plan, conduct and evaluate the learning activities for the same group of learners. It gives the participating team teacher a supportive environment, allows for development of new teaching approaches, aids in overcoming academic isolation, increases the likelihood of sounder solutions regarding the discipline of problematic students. Team teaching is a good innovation in teaching strategies and can be applied in the context of teaching computer courses especially incomprehensive ones.

Brainstorming/ Discovery

Brainstorming is a large or small group activity that encourages students to focus on a topic and contribute to the free flow of ideas. It is a fast paced, spontaneous session in which a mass of ideas is collected without the merit of any being considered when first given. According to James (2014) brainstorming can be used in computer courses such as computer and society, computer architecture, Microprocessors, computer operating system, Artificial intelligence (A.I) and many more to elicit what the students may think of the subject matter.

Tools that supports effective teaching methods of computer courses:

Almara'beh & et al (2015) stated that with multimedia, the communication of information can be done in a more effective manner and it can be an effective instructional medium for delivering information. This includes:

Internet

The internet is the network of all networks. Internet has made it possible for scholars and researchers at different locations in the world to exchange thoughts in various fields of study and allows students and lecturers to communicate both within and across international borders (Anshari & et al, 2017).

Synchronous and asynchronous tools

These are tools that permit the transmission of message in single and multiple processes. Examples are WhatsApp, skype, email etc. The use of synchronous and asynchronous tools in teaching and learning is creating new skills for students and enables blended learning and teaching in most campuses in Nigeria. Bower & et al (2015) argue that blended learning combines the use of asynchronous and synchronous methods of education with flexibility of use by both teacher and students.

Interactive White Board

An interactive white board (IWB) is a technological instrument that contains many features that engage students and enable computer images or pictures to be presented on a board with a digital projector. According Sabi et al (2018), It is one of the interactive educational technologies used in an organization and in educational institutions which has improved the instructiveness of student-to-teacher and student-to-student teaching and learning process, which aids and improves how interactive whiteboards tools are used to aid and improve teaching and learning in the classroom.

Collaborative software and video Conferencing

Collaborative software or groupware is application software designed to help people involved in a common task to achieve their goals. Video conferencing is the ability for people in different locations to see and talk to each other through technology. It may also support the electronic exchange of files, sharing of computer applications and co-working. Others includes: Computer system and its peripherals, power points e.t.c.

Strategies to improve the teacher's method of teaching computer courses.

Obineli (2008) noted that teaching and learning of computer courses in the classroom should be activity centered rather than conveying fact to learning and forcing them to internalize them. He also said that the computer brings different teaching methodology into learning. Teaching of computer courses can be improved by the following:

1. Educating Teachers

Durodolu (2020) remarked that teachers need to be properly educated to be morally responsible enough to ensure that computer systems and ICT gadgets are not adopted in the classroom as surrogate teaching but as a means to enhance innovations in teaching and learning, creativity, building confidence and sense of self-reliance in both the teachers and the students.

2. Motivation and Training Teachers

Seminars, conferences and workshops etc. should be organized to enlighten teachers/lecturers to learn innovative and effective methods of teaching and learning computer courses.

3. Employing ICT Experts

ICT experts should be employed in order to assist and train our teachers into using the multimedia tools such as projectors etc. for teaching and learning.

4. Teacher's Remuneration

Few people desire to become teachers when there are low teacher salaries. Low compensation for teaching discourages many people from entering the field. As a result, fewer teachers will be looking to fill the increased need for teachers and fewer teacher education program graduates. The general appeal of teaching as a career would increase with increased remuneration. Furthermore, paying them well and giving those benefits that are worth their work/ efforts etc. would enhance effective methods of teaching and learning of computer courses.

Methodology and Common Techniques:

The design of the study is a descriptive survey design. According to Mbah and Udegbe, (2014) it is a type of study that involves collecting data in order to test the hypothesis and to describe and interpret current relationships or compare variables.

Descriptive survey research design was used in this work to assess the methods of teaching computer courses to science students in colleges of education in Anambra state. The population of the study consists of 20 computer science education Lecturers from Federal College of Education, Umunze and 8 Computer Science Education lecturers from Nwafor Orizu College of education, Nsugbe making it a total number of 28 computer science education lecturers. A

well-structured questionnaire in gathering information and relevant facts from the respondents comprising only the lecturers of computer science education department.

Research result

The findings revealed that the common methods use in teaching computer courses to science students in colleges of education are Lecture, team teaching and brainstorming teaching methods whereas there exist other methods that will make teaching and learning of computer courses unique and interesting such as concept mapping, computer simulation, Debate and directinstruction, which are not commonly used. This is in agreement with EducationCorner.com Team (2022) that every single teacher needs a variety of different teaching methods in their theoretical teaching bag to pull from, depending on the lesson, the students, and things as seemingly minute as the time, the class and the subject. In addition, using these different teaching methods, will not only help teachers reach their full potential, but also engage, motivate and reach the students in their classes, whether in person or online. It also shows that teaching methods such as brainstorming, team teaching, simulations etc. influence the academic performance of computer student in colleges of education. This is in conformity with Stupardi, (2021) that computer simulation arouses the interests of students and are highly interactive and so increases the chances of students performing greatly in the related courses. He also noted that brainstorming method of teaching creates in students the attitude of thinking, creating ideas and finding solution to problems. Multi-instructional aid used in teaching and learning of computer courses includes: internet, desktop and laptop computers, textbook and blackboard, projector, synchronous and asynchronous tools e.t.c. Almara'beh (2015) reinforced the findings and in their work stated that with multimedia, the communication of information can be done in a more effective manner and it can be an effective instructional medium for delivering information. The strategies to improve the teachers' methods of teaching computer courses to computer science students which includes: Organizing seminar for computer teachers to improve their skills and motivate them with better working conditions, Improving the Accessibility, availability, maintenance and supply of instructional facilities required for teaching computer studies, teachers' remuneration, educating teachers etc., Durodolu (2020) corroborated the findings of this study and he remarked that, teachers need to be properly educated to be morally responsible enough to ensure that computer systems and ICT gadgets are adopted in the classroom as a means to enhance innovations in teaching and learning, creativity, building confidence and sense of self-reliance in both the teachers and the students.

Recommendation

Based on the findings and the implications of this study, it is recommended that:

1. Teachers should adopt the participatory methods of teaching to ensure active involvement of student instead of passive
2. They should learn to vary their methods during instruction.
3. School management should from time to time organize seminars and workshops in order to be expose on the digitalized means of instruction as technology changes with time.

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