Original Research Article

EFFECT OF COMPUTER-ASSISTED INSTRUCTION IN AGRICULTURE: A FOCUS ON COLLEGES OF EDUCATION STUDENTS IN GHANA

ABSTRACT

This study examined how computer-assisted instruction (CAI) affected how agricultural science was taught and learned in colleges of education. From the Ashanti and Western North regions of Ghana, two colleges of education were chosen using a purposeful selection technique. 350 pre-service teachers from the chosen colleges made up the study's population. Scores from the pre-and post-tests for the pupils were submitted to a quasi-experimental design. While the students in the control group were taught the same concepts using the traditional method, the students in the experimental group learned agricultural concepts through the CAI. The traditional mode of instruction included lectures, group discussions, and question and answer sessions. The study's results demonstrated that pre-service teachers who received CAI performed better than their counterparts who received traditional classroom teaching. Recommendations about the necessity of creating pertinent CAI packages for teaching agriculture in Ghanaian colleges of education were made based on the research findings.

KEYWORDS: computer-assisted instruction, academic performance, Achievement,

Introduction

The computer has improved our lives in unimaginable ways over the past 50 years and continues to be one of the most potent forces influencing all facets of human life (Chalmers, 2000). The early 1960s saw the introduction of computers into the classroom (Morrell, 1992); and for education, generally, computer use in all its forms seems to provide practically unlimited opportunities for enhancing teachers' instructional tactics and enriching learners' experiences. Particularly, factors like the unbalanced shift in the numbers of students and teachers, the complexity of content brought on by the sheer volume of data, and the relevance of some applications that highlight individual differences encourage people to use computers in education (Alkan, 1998; Uşun, 2000).

Many terminologies have entered and left usage in education as a result of the use of computers in instruction (Owusu, Monney, Appiah, & Wilmot, 2010). Bybee, Poewll, and Trowbridge (2008) divided the overlapping words for using computers and related technologies in science education into three categories: learning about computers, learning with computers, and learning through computers. The computer seems to be a technology that, when properly incorporated into the classroom, can especially benefit science education. The use of computers in education is now given due to the quick growth of information and communication technologies. The use of technology in the classroom gives pupils a better setting in which to learn, fosters curiosity and a learning-centered environment, and helps students become more motivated. This kind of technology use is crucial to the teaching and learning process (Baytekin, Balkan, Horzum, & Kyc, 2002). Although using computers in the classroom will not solve all issues in agricultural science education, they can be considered a useful supplement to other methods if properly incorporated. ICT integration into every facet

of school life in wealthy countries has been heavily pushed in this direction. By 2005, almost all public schools in the United States had access to the Internet, according to Wells and Lewis (2006). Recent studies in the UK and the USA have found that the question of whether ICTs are utilized in classes is no longer relevant; rather, what students preferred for the level of technological balance in their courses (Salaway & Caruso, 2008). In contrast, it is said that although many African developing nations have implemented ICT policy changes and services, a sizable portion has not fully benefited from ICT as a tool because of financial and organizational considerations (New Partnership for Africa's Development (NEPADs), 2001). Alessi & Trollip (2005) claim that five different categories of educational software exist, including tutorials, drill and practice, simulation, educational games, and hypermedia types. These strategies should be employed in some classroom activities for efficient and successful instruction. Presentation, demonstration, practice, and learning evaluation are some of them (Zmen, 2004). Computer technology allows students to actively participate in the learning process, build knowledge, hone their problem-solving abilities, and find alternative answers (zmen, 2008). Since it is utilized for knowledge presentation, testing and evaluation, and feedback, computer-based instruction makes teaching approaches significantly more successful than those of traditional teaching methods.

The individualization of education is aided by it. It inspires pupils and encourages them to participate actively in their education. It aids in the growth of learners' identity, independence, and creativity as problem solvers. Drawings, graphics, animation, music, and a variety of other materials are provided by CBI so that the students can work at their own pace and according to their unique needs. It serves to regulate several factors that affect learning but cannot be regulated by conventional educational methods (Kasl, 2000; Chang, 2002).

Computer literacy was recently formally included in the curricula of pre-tertiary educational institutions in Ghana as part of an educational reform. The majority of the curricula focus on

computer-related topics, but little attention is paid to the vast array of purposes that a computer might be put on once the service is provided. Our goal in this work is to provide evidence that instructors and students may benefit from computers in ways other than mere computer literacy, which could be the situation in many developing countries.

This paper adopts the stance that any attempt to use computers in a specific way, particularly in a developing nation like Ghana, should be supported by carefully researched evidence. If the nation uses its limited resources for technology, they must be used to the fullest extent possible. They should not be restricted to computer education courses only. The usage of computers in the classroom is required. Therefore, the study compared CAI's effectiveness to the traditional method of teaching agricultural science.

Objectives of this study:

What impact does computer-assisted instruction have on agriculture education at Ghanaian colleges of education

Literature review

They may be better able to comprehend and study the material if ICT is used as a teaching and learning tool for agriculture science. Walstad (2001) asserts that recent decades have seen no change in the teaching and learning of agriculture. He added that agriculture science instruction in the Maldives in Asia throughout the 20th century was mostly characterized by passive learning based on the conventional method of "chalk and talk." Jegede (2002) stated that despite the large benefits of ICT, society is too sluggish to adopt its use. This is supported by Jephcote (2004). This could then represent a challenge to the growth of a country like Ghana, where education is the "par excellence" tool for achieving national development.

Therefore, if Ghana is to employ ICT to keep pace with the rest of the world's technological growth, it must prioritize teacher education as its guiding principle.

Behavioral and cognitive theories provide support for the theoretical foundation of this investigation. Behavioral theory in the form of operant conditioning is one of the most significant theories applied in numerous computer studies. Operant conditioning is a type of learning in which a person performs an activity known as an operant to get a particular response. If a pleasant item comes after the operator, the outcome will be reinforced adversely.

When the proper answer is supplied in computer-assisted learning, the behavior is reinforced by the appropriate response to the following steps (Salahudeen, 2012). Tabassum (2004) For computerized learning, particularly drills, practical work, and tutorials, Skinner's reinforcement theory is crucial. Owusu et al. (2010) asserted that the idea of practice and reinforcement, particularly in the tutorial mode, supports computer-assisted instruction primarily from the behavioral standpoint of learning. Conversely, cognitive theorists acknowledge that most of the learning includes contiguity and associations formed by repetition. They also acknowledged the value of rewarding, albeit they focused on how it may serve as a motivator by providing feedback on the accuracy of the replies. According to Furst (1958), cognitive theorists defined learning as the acquisition of cognitive structures through the discovery or restructuring of human information. Cognitivism, which recognizes the role of background knowledge in how content can be carefully selected, practiced, and arranged from simple to complicated lesson material, is related to this study. International Journal of Education (IJE) Vol. 4, No. 03, August 2019 10.

Senteni's study from 2004 revealed that CBI helped pupils become more motivated, achieve more, and form positive attitudes. Studies have shown that using computers in the classroom

dramatically improves students' attitudes and accomplishments (Berger, Lu, Belzer, & Voss, 1994; Geban, 1995)

Learning about computers, learning with computers, and learning via computers are the three categories into which Bybee, Poewll, and Trowbridge (2008) divide the applications of computers and related technologies in science education. Learning about computers, which is concerned with the understanding of computers, can be viewed as a continuum that goes from computer awareness and skill at the lower end to programming at the upper end (Tabassum, 2004). Students in this environment learn technology literacy, which mainly entails learning terms connected to computers. It may also cover historical computer development and the learning of basic programming techniques for familiarity with computer applications. In this case, the teacher only instructs the pupils on the material that is expected of them about computers, such as the names of the various components, keyboard etiquette, and software usage, among other topics that may be outlined in the current computer curriculum. Here, just like in agriculture, computers are taught as a separate and distinct subject.

In computer-assisted learning, students employ computers in a variety of ways, including for data collection, analysis, communication with others, and information retrieval. The computer can be utilized for data processing and many forms of presentation (Thomas, 2001). Data analysis uses software tools like SPSS and Excel. According to Voogt and van den Akker (2001, pp. 2473–2477), word processors, spreadsheets, and other apps help students organize their material and display it in a variety of formats. Both professors and students frequently utilize the internet to find material for projects and studies. Furthermore, communication between students and teachers is possible online. The use of computers and the internet for teaching and learning has moved in this direction, almost becoming a formal profession. There is also an option for video conferencing, which is helpful in group learning settings and

is also utilized to support remote learning. Additionally, with computer-assisted learning, students utilize computers to write reports, complete homework assignments, and present reports such as lengthy essays and term papers, while professors may also use computers to conduct informational searches and present course materials in a PowerPoint format. According to Ornstein and Levine (1993, p. 551), students choose whether or not to use a computer as a tool, rather than the teacher requesting it.

In computer-assisted learning, computers either take over or help the teacher with several aspects of instruction. "Learning from computers comprises techniques of computer-assisted instruction in which the computer is employed as a way of transferring specific subject knowledge," claim Soe, Koki, and Chang (2000). In this method, the student receives information primarily through the computer. The learning materials or exercises are presented by the computer to the pupils, who then participate in them. The computer keeps track of the student's development during the encounter (See et al., 2000) According to Ornstein and Levine (1993, p. 551), CAI emphasizes tutoring and/or drill-and-practice programs and is suitable when a subject matter needs to be mastered or for the practice of fundamental ability before moving on to higher levels of learning. According to Cotton (1991), computer-assisted training most frequently refers to drill and practice, tutorial, or simulation activities that are delivered either independently or as a complement to conventional teacher-led instruction. According to Voogt and van den Akker (2001, pp. 2473–2477), tutorial and drill software preprogrammed teachers in doing some of their duties.

Thus, in the CAI mode, the computer can be utilized either directly to instruct students as in a tutorial application or to support the instruction students as in drill and prapracticehe CAI mode of the PC was used for this study. This study specifically used the CAI's lesson system. Therefore, it must be made clear that even while technology has become an integral part of

contemporary society and presents new opportunities for learning and teaching, educational theory must still be used to inform the development of these instructional prapracticesild & Quinn, 1998). The behbehavioristadition in psychology is where many contemporary instances of teaching machines, automated, and computer-assisted educational systems, had their theoretical start (Edwards, 1970). An important benefit of CAI, according to Chabay and Sherwood (1992), is that it necessitates that the student task takes an active role in the learning process. They claim that for anything to happen, the learner must engage with the computer, not just that, but it is also required. This is because the student must use the computer's input devices to go from one screen of information to the next. As a result, the student cannot simply observe; they must give input. As a result, Skinner accepts the continuity principle but emphasizes the significance of the reinforcement occurring immediately after the response (Tabassum, 2004).

METHODOLOGY

Research Design and Population

Quasi-experimental research design consisting of a non-equivalent control group and an experimental group was adopted for this study. The quasi-experimental research design was used for this study because there was no random assignment of the subjects to treatment conditions. Nworgu (2015) in agreement with this said that in a situation where there is no randomization in the assignment of individual participants to treatment conditions, the quasi-experimental method is most suitable. The population of the study consisted of four hundred (350) pre-service teachers (230 males and 120females) in two colleges in the Ashanti and Western regions of Ghana. The sample consisted of 22 (16males and 6 females) pre-service teachers who were purposively selected from the two colleges. Fifteen pre-service teachers

(10 males and 5 females) were selected from Wesley College of Education in the Ashanti Region to form the experimental group, while seven pre-service teachers (5 males and 2 females) from Wiawso College of Education in the western north of Ghana served as the control group. The intact class was used in each of the schools (Wesley College and Wiawso College). The instrument used for data collection was the Performance Test titled performance improvement test which was developed by the researchers. The first-semester course outline for colleges of education was used. The fifty-item multiple choice objective test was validated and its reliability was determined using the Pearson correlation coefficient formula yielded 0.81 coefficient reliability. The duration of the study was eight weeks. The first week was used for pre-test administration, six weeks for teaching the agriculture content, and eight weeks for post-test administration. The research question was answered using mean and standard deviation.

RESULTS

Research Question

What is the difference in academic performance of students taught with CAI and those taught with the traditional teaching method as determined by their mean performance scores?

Table 1 Pre-test and post-test means and Standard Deviations of performance scores of pre-service teachers taught with CAI and those taught with the traditional method

Source of Variance	N	pre-test mean	SD	Post-test mean	SD	Mean gain	Remark
Experimental group	15	13.73	3.127	41.60	3.13	27.87	positive effect
Control group	7	13.57	3.735	33.43	6.77	19.86	Positive effect

The difference in mean gain is 8.01

Both the experimental and control groups have favorable effects, according to Table 1's results. However, the experimental group's mean gain of 27.87 (41.60-13.73) is higher than the control group's mean gain of 19.86. (33.43-13.57). This demonstrates that CAI is superior to the conventional mode of education in terms of improving students' academic performance in agriculture.

DISCUSSION OF RESULTS

Table 1 showed that, in favor of the experimental group, pre-service teachers teaching the same lesson using the traditional method performed much worse academically than those teaching it using CAI. In more precise terms, the experimental group's mean gain was 27.87 while the control group was 19.86. This resulted in an 8.01 difference in favor of the experimental group. This result is in line with that of Paul, Moses, and Brandford (2013), who discovered that pre-service teachers who learned the same lesson utilizing CAI outperformed those who learned it using the traditional technique in terms of academic achievement. The results of Orjika's (2012) study, which looked at how CAI Packages affected secondary school students' academic achievement and interest in biology, are consistent with this conclusion. The results support those of Okigbo & Okeke (2011) and Nzewi (2010). Based on their findings, they concluded that CAI can assist students in meaningfully organizing and visualizing abstract concepts. As a result, CAI is particularly good at teaching and learning about agriculture and other areas that are related to science. According to Orjika, students who were taught biology using CAIP outperformed those who were taught using the expository method.

In addition, Doaa (2014) discovered that the experimental group (taught by CAI) considerably outperformed the control group in terms of academic accomplishment in terms of Basic Ballet Skills. The findings of past research and the current study are comparable, indicating that using CAI in instruction improves students' academic performance.

Conclusion

Based on the results of this study, it was determined that there is a real difference between students who are taught agricultural science using CAI and those who are taught using the conventional technique in terms of mean achievement. CAI is a cutting-edge and efficient teaching method that has the power to raise pre-service teachers' academic achievement in agriculture.

Recommendations

The findings of this investigation led to the following recommendations being made.

1. To enhance the academic performance of future teachers, CAI should be explicitly incorporated in agricultural science courses at colleges of education.

2. Tutors should make sure that CAI is used consistently and effectively for agricultural science classes.

3. Tutors should regularly conduct training sessions on how to use CAI effectively for instruction.

4. To ensure that students can fully benefit from CAI, educational institutions should be equipped with computers and internet access.

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