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The Influence of Information and Communication Technologies on Students' Academic Performance

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Abstract

The present study investigated the Influence of Information and Communication Technologies (ICTs) on students' achievement. One hypothesis was postulated and tested in the study as follows: there will be no statistically significant relationship between Information and Communication Technologies (ICTs) on students' achievement. A total of 120 participants were employed for the study. They were selected through simple random sampling technique (Yes/No). A 16-item questionnaire on the usage of Information and Communication Technologies (ICTs) on students' academic performance was employed. It was scored on Yes/No format with a norm of 19.5. The questionnaires were distributed to them to fill in their classrooms. The second part of the questionnaire focused on students' knowledge and experience of computers and internet services. The design adopted for this study is a cross-sectional one because of differences in the participants' characteristics. Chi-square statistical tool was used because of the nature of data collected. The results indicated that there was no statistically significant relationship between Information and Communication Technologies (ICTs) and students' academic performance with $\boldsymbol{X}^2=2.06$*; critical F value of 3.84 with 0.05 level of significance. Discussions were made based on the findings, implications and recommendations of the study.*

Introduction

Information and Communication Technologies (ICTs) are generally accepted as a modern instrumental tool that enables the educators to modify the teaching methods they use in order to increase students interest. Its general definition covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form. It consists of hardware, software, networks and media for collection, storage, processing, transmission and presentation of information (voice, data, texts and images) (World Bank, 2002).

Information and communication is integral to human society. Before the advent of technology in Nigeria, people communicated using various instruments and codes such as talking drums, flutes, gongs, town criers and village square meetings (Dev-Net, 2003). The use of writing and invention of printing materials transformed the type and context of recorded history

communication on a universal scale became possible through the use of Books, Newspapers, Magazines and Radio. The advancement in technology has created so many ICT tools that are necessary and useful in the development process. These new technologies are central to contemporary societies and therefore referred to this age as information technology age driven by knowledge economy. The education community is not left out in this trend as there have been considerable investments towards teaching and learning methods that necessitated the quest to measure the impact of these investments on students' academic performance as return on investment in education. Although interest has been on how to use ICTs to support teaching methods in order to enhance motivation to learning, students' characteristics as well as teachers have been noted as hindering factors. But the need arises for one to look at both direct and indirect effects of ICTs to learning. This article seeks to explore the ways in which advances in ICT and their use in education, particularly influences students' performance/output to learning.

The primary aim of this study is to encourage more direct research and discussion on the issue of how ICTs can contribute to students' performance. The major interests are:

1. To measure how the use of ICT tools in teaching and learning has impacted on students' performance;
2. To measure how the use of ICT tools have improved the student-teacher interactions in classroom, as a factor that facilitates good performance;
3. The direct effects of ICTs as well as the indirect effects through the traditional channels or methods of teaching, taking into consideration the students' characteristics, educational environment, and teachers' characteristics as elements that may have impact on the outcome of education.

Theoretical Review

There are several theories that have heavily influenced the development of educational software towards learning:

Cognitive theories (Kohler, 1926)

Cognitive theories lay emphasis on the cognitive aspect of learning including information processing models. They entail how people understand materials based on these principles:

i. Individual's aptitude and capacity to learn, based on psychometrics and testing
ii. Learning styles
iii. The basis of the educational approach known as constructivism, thus emphasizing the role of the learner in constructing his own view or model of the material.

Gestalt theories were proposed by Wertheimer, Kohler & Koffka (1925), using cognitive therapy, from individual's perception to problem-solving ability. Kohler (1925) posited that problem solving ability involved mental combination and recombination of various elements of a problem until a structure that solves the problem is achieved.

Piaget's developmental theory (1970) on the other hand, focuses on the maturational factors affecting understanding. Piaget's theory of intellectual development is a plea that children be allowed to do their own learning using good pedagogy and thus present the child with situations in which he himself experiments in the broadest terms. Accommodation versus Assimilation dialect is the part most useful for understanding mature learners.

Behavioral theory (Skinner, 1938)

This theory had the most influence from the work of American Psychologist Burheus F. Skinner. Skinner believed that people can learn more effectively if their environment is carefully controlled. He developed the principles of operant (behavior) conditioning, which basically stated that; "if the occurrence of an operant is followed by the presentation of a reinforcing stimulus, the strength is increased" (Skinner, 1938).

Social learning theory (Bandura, 1963)

This theory as proposed by Albert Bandura (1963) focuses on the learning that occurs within a social context. It considers that people learn from one another, including such concept as observational learning, imitation and modeling. It serves as a bridge between the Behaviourist learning and the Cognitive theories, which maintained that learning has to be represented by a permanent change in behavior (Behaviorist); and that cognition plays a role in learning from perception to problem-solving ability.

Constructivist theory (Seymour, 1980)

This was backed up by the work of Seymour Papert (1980) that proved Computers as useful in higher learning. Papert's view of the importance of motivational engagement of the learner contrasts sharply with Skinner's who although recognizing this influence, consider it unnecessary for instruction.

In this view, the learners as active participants are involved in structuring their own learning experiences. Papert's work with Piaget who emphasized the way in which knowledge is structured using computers are organized as well as how the learners' own perception of their prior experiences perform the knowledge structure. Thus, the importance of how a learner relates new experiences to existing knowledge becomes paramount.

Empirical Review

Some of the studies conducted on the use of ICTs in education and social sciences reflect on their findings certain factors within and outside the students; individual characteristics, educational environment, and teachers' characteristics as influential to ICTs usage. Others suggest that the traditional method of teaching and learning are more effective to performance than the use of ICTs. Coates et al (2005), Astin (1999) compared the use of face-to-face method of teaching with online teaching after taking into account students' characteristics and selection bias and therefore reported that the students in the online format scored 15% and 14.1% higher than students in traditional method.

Terry, Lewer & Macy (2003) & Leuven et al (2004) comparing three methods of online, on-campus and hybrid methods of teaching reported that there is no evidence for a relationship between increased educational use of ICT and students' performance. In fact, they found a consistently negative and marginally significant relationship between ICT use and some students' achievement measures.

Kulik (1994) reported using meta-analysis study that on average; students who use computer-based instruction scored higher than students without computers with an added advantage that the students also learn more in less time and like their classes learn more when computer-based instruction was included.

Hypothesis

There will be no statistically significant relationship between the students' use of computer and their performance.

Method

Participants

A total number of 120 participants were employed for this study. The population of the participants was made up of 300 level students of the Department of Psychology, Imo State University, Owerri. The ages of these participants range from 18 to 30 years with a mean age of 23. They were selected through a simple random sampling technique (Yes/No). The selection of the participants was done in the school classroom thus eliminating biases that tend to result from age differences and intelligence levels through the provision of a column for age range and a-15 minute pre-test on two of the courses undertaken.

Those whose ages fall within the age range of 18 and 30 were subjected to a-15 minute test in MCQ mode, containing items they are familiar with in order to obtain their score on intelligence.

Instrument

The instrument employed in this study was a self-developed scale on the extent of use of Computers and Internet Services by the students of Imo State University, Owerri. It is a 16-item questionnaire designed to elicit responses on students' use of computer and Internet services to learning. The instrument made provision for the participants to fill in their age, gender, name and level of education. All the items were scored equally and directly because they were direct questions. The norm of the scale is 19.5. The participants' performance scores were got through a test conducted on two of their Courses, Psychology 221 and Psychology 243. This was done to examine the extent of the relationship between their responses on the use of Computers and Internet services and their Classroom performance. The scores were got and their average scores on the two courses were taken for the study.

The extent of the use of computer and Internets by the students of Imo State University was validated through a Pilot study with a sample of 20 participants. The scale has a Cronbach's

Alpha reliability coefficient of 0.651. This shows a good degree of internal consistency among the items of the instrument.

A total of 20 participants were used for the validation of the instrument. The population was made up of males and females of 300 level students of Imo State University, Owerri. The norm of the scale is 19.5, those who scored 19.5 and above were identified as those whose performances are associated with the extent of use of computer and Internet services to learning, while those that scored below 19.5 are those whose performances were not associated with the extent of use of computer usage to learning. The scale followed a direct formula of 'Yes' and 'No'. In scoring, those that ticked 'Yes' scored 2, while those that ticked 'No' scored 1.

Procedure

The responses of the participants were collected by means of structured questionnaires. The sample of the research was chosen from the undergraduate students of the Department of Psychology, Imo State University, Owerri. The research sample consisted of 120 participants from the Department and questionnaires were distributed to them in order to complete them. The questionnaires were divided into two parts. The first part of the questionnaires sought the demographic characteristics of the respondents in the sample. One hundred and twenty questionnaires were obtained.

The second part of the questionnaire focused on the students' knowledge and experience of using computers and internet services on and off campus. The area examined whether respondents have internet access off campus; whether they use e-mail, chatting and other internet tools; and finally whether they visit often the University Library to support their studies. At first, the respondents were reluctant to participate in the study. The respondents were not compelled in any way to fill the questionnaire, rather the researcher gently sought for their co-operation to fill the questionnaires. They were encouraged to open up towards their responses. At the end, the questionnaires were retrieved from the participants and they were thanked for their immense co-operation in the course of conducting the study.

Design/Statistics

The design adopted for this study is a cross sectional design. Cross sectional design allows researchers to describe the characteristics of a population or the differences between two or more populations, and researchers can make predictions based on the correlation survey data (Shaughnessy, Zechmeister & Zechmeister, 2000).

The statistics suitable for this study is a chi-square. This is because the data obtained are in nominal, not in the interval scale.

Results

The results of the study showed that there was no significant influence of Information and Communication Technology (ICT) on students' academic performance with calculated chi-square of $\mathbf{X^2}$=2.06 and critical **F** value=3.84. The results of the study were summarised in Table 1.

Table 1. Academic Performance.

	High Academic Performance (A)	Low Academic Performance (B)	Row Total
ICT	37 (33.07)	27(30.93)	64
Non-ICT Usage	25(28.93)	31(27.07)	56
Column Total	62	58	Grand Total=120

From the table of X2 at significance level of 0.05 and degree of freedom 1, the critical value is 3.84.

Since the calculated chi-square value of 2.06 is less than critical chi-square value of 3.84, we accept the null hypothesis and reject the alternate hypothesis. Therefore, there is no significant relationship between Information and Communication Technology (ICT) usage and academic performance.

Discussions

The results of this study indicate that there was no significant relationship between Information and Communication Technology usage and the academic performance of students. The results are in line with the findings of Terry, Lewer & Macy (2003) that the predicted examination scores for students in the on-line courses were significantly less than those of students in the on-campus and hybrid format. The findings of Kulik (1994); Coates et al (2004); Leuven et al (2004) & Astin (1999) also gave more credence to the findings of other researchers.

With the comparison of the examination scores between students in the hybrid and students in the on-campus classes, there was no significant difference. The study of Sheard et al (2007), on performance and progression of first year ICT students showed a similar outcome to this result. The results of the study indicated that there was an influence of prior experience towards programming on those who performed well.

However, a case study with the University of Macedonia students, reviewing the impacts of ICTs in Education using gender and students performance as independent variables, showed that male students were more favorable toward ICT usages than females and those who performed well in "Introduction to Computers" were more likely to find out that there is significant relationship between ICT and their performances.

Implication of the study

From the study, results imply that there was no statistically significant relationship between ICT usage and academic performance of students. This goes further to imply that prior experience, determination, dedication, perseverance and efforts are necessary ingredients for the achievement

of success in academics. Intelligence and the environment should also be implicated when the degree of academic performance of the students are considered.

Limitations of the study

There were some factors, which served as challenges, problems and difficulties to the researchers in their study. The first and most important is finance. This was needed for developing and validating the Information and Communication Technology (ICT) scale.

Another limitation was getting the 300 level students and their academic performance scores, which was very tedious because the school was on a short break at the time the study was conducted. The school environment, as of the day the study was conducted, was very noisy and non conductive for the researchers and the students.

Suggestions for further studies

Further researchers wishing to undertake a study on ICTs should strive to investigate the influence of Information and Communication Technologies on job performance; influence of Information and Communication Technologies on job satisfaction; influence of Information and Communication Technologies on problem Solving abilities of students. With larger samples, the researcher can investigate the influence of Information and Communication Technologies on Manual Dexterity. Researchers when carrying out this study should ensure that the school environment is free and void of noise and every sort of disturbances and distractions. Researchers should also make sure that the participants to be used when carrying out this study should be familiar with the use of ICTs and the traditional method in learning, whether it does actually influence their performances in academics or job satisfaction.

Recommendations

Parents/Guardians should encourage their children by enrolling them into ICT programs at an early stage. This is to help them acquire knowledge and exposure about computers before attending higher institutions. Management of schools should make or include computer packages or training as a compulsory subject in their schools as they will also help students to get use to ICT. Equipment/facilities are provided to schools and individuals at an affordable or cheaper rate, as this will raise the consciousness and reawaken people on ICT usage.

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