Computer Efficacy, Use and Phobia: Contributions to Nigerian Undergraduates' Academic Performance in a Computer Graphics Course

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Abstract

This study investigated the extent to which computer efficacy, computer use, and computer phobia predicted the level of students’ academic performance in a Computer Graphics course. One hundred eighty-nine undergraduates of the Faculty of Education, Olabisi Onabanjo University, Nigeria, served as the sample for this study. The study sample responded to four instruments: Computer Self-Efficacy Scale (CSES), Computer Use Scale (CUS), Computer Phobia Scale (CPS) and Computer Performance Test (CPT). Pearson Product Moment Correlation, Multiple Regression and Analysis of Variance statistical tools were used to investigate the predictive capacity of the independent on the dependent variables. The findings revealed the three independent variables, when taken together, were effective in predicting students’ academic performance in a Computer Graphics course. Meanwhile, each of the variables also contributed to the prediction of students’ academic performance in a Computer Graphics course with computer use making the highest and a significant contribution to the prediction of the outcome measure (students’ academic performance in a Computer Graphics course). On the basis of these findings, it was suggested higher education institutions in developing countries should make a major paradigm shift from the traditional instructional environment to promoting paperless classrooms and facilitate students’ intense use of computer technologies by making assignments and projects writing, seminar presentations, display of course outlines and reference materials, and academic enquiries more computer-oriented.

Introduction

Developments in Information and Communication Technologies (ICT) have been making a great impact on almost every aspect of human sectors, thus technology is challenging and re-directing human lives. To a large extent, Information Technologies (IT) is a dramatic influence in the education arena (Groves & Zemel, 2000; Khorrami-Arani, 2001). In view of the demands of the labour-market, institutions of higher learning in developing countries such as Nigeria are striving towards making institutions’ environments ICT compliant to gain more effectiveness in the teaching and learning process. Sam, Othman, and Nordin (2005) note recent trends in instructional process witness immeasurable alteration and transformation by the emergence of an avalanche of computer technology innovations.

Sax, Astin, Korn and Mahoney (1998) cited in Sam, Othman, and Nordin (2005) pointed that computer technologies have become students’ inevitable tool for assignments, study notes, accomplishing self-organised tutorials, research project data processing as well as easy and fast means of communication. The use of IT for teaching and learning at all levels of educations is becoming the order of the day in Nigeria. In line with the National Policy on Education (NPE), undergraduates in Nigerian
Research findings indicate that high computer anxiety is similar to detracting cognitive resources from task performance (Schmidt, 2003; Bozionelos, 2001). Negative comments about computers and avoidance of computer usage (Anderson, 1996; Bandura, 1994; Beckers & Rosen & Weil, 1992) can lead to physiological reactions to computers; thus exhibit behaviours which may include the use of computers for a limited time, response definition of the term computer anxiety. Individuals who are “compuphobic” display negative behaviour and computer phobia. Computer phobia and computer anxiety are interchangeably used to describe the fear of impending interaction with a computer that is disproportionate to the actual threat presented by the computer (Chua, Chen, & Wong, 1999; Oliver & Shapiro, 1993; Smith, 2001a). Summarily, computer anxiety is a real phenomenon according to Doyle, Stamouli, and Huggard (2005) is a psychological response to the computer-related experiences (Doyle, Stemouli, & Huggard, 2005; Faseyitan, Libii, & Hirschbuhl, 1996; Oliver & Shapiro, 1993; Smith, 2001a). Summarily, CSE is the confidence an individual has in his ability to execute given tasks via the computer system. Critically viewed, CSE can not be basically based on experience or level of skills’ acquisition, but rather considered as an outgrowth of self-pictured capability.

Academic researchers have delved into the influence of self-efficacy (SE) on varied performances; Hacket (1985) and Pajares and Miller (1991) found a correlation between Mathematics SE and Mathematics problem solving; a positive correlation between CSE and training performance (Protosky, 2002); students with higher CSE demonstrate greater enthusiasm towards enrolling in computing courses than those with lower beliefs (Zhang & Espinosa, 1998); CSE is a significant factor in differentiating adopters and non-adopters of technology (Faseyitan et al., 1996). This is why Webster & Martocchio (1992) posited the higher the computer self-efficacy, the better individuals are likely to be positively disposed to using the computers. Similarly, Smith (2001a) argued students with high level of CSE are in a vantage position of learning new concepts via computer and such students are likely to expend less effort towards utilising computers. Meanwhile, Ellen, Bearden, and Sharma (1991) reported individuals with high CSE are less resistant to technological change. In the opinion of Marakas, Yi, and Johnson (1998), CSE does not only affect persons’ perception of his ability to perform given tasks via computer, but also his motive towards putting computer to use in the future.

In recent times, the use of computers in education is gaining ground beyond imagination. Computer use encapsulates elements like the quantity, available opportunity, and frequency for its use. Rieber (2005) noted in many developing countries, educators often give account of the number of computers available in schools, but the extent to which they are used by the students and even the teachers are seemingly of less concern. Studies have shown that individual’s attitude to computers and frequency of its use is influenced by the level of confidence and state of enjoyment (Gressard & Loyd, 1986). Meanwhile, Smith (2001a) reported that individual’s computer experience based on computer usage determines the level of belief and confidence about using computers to accomplish tasks.

Computer phobia (CP) is a symptom of the modern times invented by the changing nature of technology. Brosnan and Davidson (1994) reported that almost one third of individuals within a population exhibit certain degrees of computer phobia. Computer phobia and computer anxiety are interchangeably used to describe the fear of impending interaction with a computer that is disproportionate to the actual threat presented by the computer (Chua, Chen, & Wong, 1999; Rosen & Weil, 1992). CP, “a real phenomenon” according to Doyle, Stemouli, and Huggard (2005) is a psychological response definition of the term computer anxiety. Individuals who are “compuphobic” display negative behaviour and physiological reactions to computers; thus exhibit behaviours which may include the use of computers for a limited time, negative comments about computers and avoidance of computer usage (Anderson, 1996; Bandura, 1994; Beckers & Schmidt, 2003; Bozionelos, 2001).

Research findings indicate that high computer anxiety is similar to detracting cognitive resources from task performance.
One of the findings of this study is that the combination of the three predictor variables (computer efficacy, computer use, and computer phobia) jointly predicted students' performance in computer graphics course. The observed F-ratio of 42.095 significant at .05 level was evidence that the combination of the independent variables in the prediction of students' performance in computer graphics would not have been by chance. The fact still remains that a coefficient of multiple regression of .637 and a multiple $R^2$ of .406 are indicators of the magnitude of the relationship between the independent variables and the criterion variable. Drawing inference from the data in Table 2, it is evident that a linear relationship of the three predictor variables accounted for 40.6% of the total variance in the Nigerian undergraduates' performance in a computer graphics course.

The outcome of this study contradicts the findings of Karsten and Roth (1998) who found no relationship between computer self-efficacy, computer use, and computer phobia in university, when many have never had such an opportunity. As a matter of fact, computer knowledge and confidence demonstrated by some students in schools are often acquired fortuitously by trial and error form of interactions with computers in the public cyber-cafes and conscious efforts made on the part of individuals to learn from friends. The background provided so far underscores the relevance of computer competence to computer education students. Overcoming anxiety is one of the key components of computer efficacy required for promoting and improving an individual's level of computer use. Marakas, Yi, and Johnson (1998) highlight the complexity of computer self-efficacy construct, but solicited further research. Doyle, Stamoulis, and Huggard (2005) argued the relationship between computer anxiety, computer self-efficacy and computer experience in students depend on the nature of the students under investigation. Nigerian schools were very late in the up-take of Information and Communication Technology for instructional purposes; hence the need for a review and assessment of learners’ effective use of the computers vis-à-vis their academic performances becomes expedient. However, there seems to be little or no research efforts related to computer competence of Nigerian students and the extent to which variables like computer self-efficacy, computer use, and computer phobia can relatively or jointly predict their performance in a computer graphics course. However, these variables are central to good academic achievement in a graphics course in the sense that excellence is possibly determined and measured by level of computer competence. The purpose of this study therefore was to investigate the predictive levels of computer self-efficacy, computer use, and computer phobia on the student's academic performance in a computer graphics course.

**Discussion**

Computer use was a strong predictor of the criterion variable as revealed in Table 3 ($F_1, 187 = 103.059, R = .596, R^2 = .355; p < 0.05$). This shows that computer use only contributed 35.5% towards the prediction of Nigerian undergraduates' performance in a computer graphics course. Meanwhile, when computer efficacy was entered into the model as the second predictor variable, a significant prediction of 38.7% was revealed ($F_2, 186 = 9.745, R = .622, R^2 = .387; p < 0.05$). The results further showed that computer phobia made the least contribution to the prediction of students' academic performance in CG ($F_3, 185= 5.694, R = .637, R^2 = .406; p < 0.05$). By implication, computer phobia contributed an additional 1.9% to the prediction of the variance in Nigerian students' performance in computer graphics.

This outcome tilts towards the findings, opinions and assertions of earlier research that student's frequent use of computers correlates with performance in computing (Saleh, 2007); computer access, and frequent use of computers correlate with students' higher test-scores (Attewel, & Battle-Juan, 1999; Bussiere & Gluszynski, 2004) and students achieve higher scores when they intensively use computers (Senkbeil & Wittwer, 2007). The findings of this study indicate that computer use contribution to the criterion variable was not too low and at the same time not encouraging ($R^2 = .355; p < 0.05$). It is therefore obvious that the frequency of computer use may not always be proportionate with...
student's academic performance, but rather with the purpose and quality of its frequent use. It is therefore glaring that students who study humanities and arts, and thus foresee no relevance of computers in their academic pursuits and careers in the future, often tend to be complacent about acquiring computer skills and knowledge. However, students who naturally have flair for computer technology are exceptionally explorative.

Computer efficacy is also a significant predictor of undergraduates' performance in a computer graphics course. Tella and Tella (2003) reported self-efficacy is a better predictor of academic performance, while Gist, Schwoerer, and Rosen (1989) reported computer use and efficacy positively relates to higher learning performance. The outcome of this study is an indication that many students who have disrupted access to computers tend to regard themselves as "computer handicaps" when confronted with performing tasks using computers, especially in the public. This syndrome of inferiority complex on the part of students who are "computer-weakling" probably explains why students' enrolment in computer related courses in the faculty of education in many Nigerian universities is often low. Meanwhile, Karsten and Roth (1998) found that computer use and computer efficacy positively correlates with performance in introductory courses. The outcome of this study further shows that computer efficacy has a relationship with Nigerian students' performance. The association is not only in introductory courses, but also in the core courses (such as computer graphics, instructional technology) which are paramount to education students who need to apply the knowledge gained in the course(s) on the field of practice during events such as teaching practice.

The results further indicate that computer phobia has a significant predictive value to students' performance in CG course. Contradicting the outcome of this study; Davis (1999). Wingenbach (n.d.) reported that there exist no relationship between students' computer anxiety levels and their academic achievement. This study indicates that computer graphics' anxiety correlates with level of computer anxiety. By the outcome of this study, it could be inferred that extrovert students may have less inhibition about using computers to accomplish tasks compared to their introvert-counterparts. Such students often have their academic performance encouraging and commendable in view of their high level of inquisitiveness and interest in environmental exploration. This is because designing and producing visual materials with computer software require specific skills that must be acquired by practice and regular use of computers. Students who are computer-friendly and confident about their ability to effectively utilise computers to accomplish given tasks are not likely to exhibit traits of fear, anxiety, and nervousness towards using computers effectively. As a matter of fact, such students are not likely to yield to one of the un-productive strategies of computer usage (avoidance, fake trial, fidgeting, un-due tension and profuse sweating, lack of concentration, last number turn-taking, seeking un-necessary assistance, etc.).

There are clear implications of the findings of this study. Nigeria is in the early stage of technology integration into all levels of education. Teachers and faculty of education undergraduates' (prospective secondary school teachers) low level of computer competence is a bad omen for the quality of the education system in Nigeria. Acquisition of reasonable ICT skills is becoming a considerable factor to gainful employment in most private and corporate organisations. Teaching may not likely be an exemption in the nearest future, it therefore follows that university graduates without required computer competence may find it hard to gain entrance into the teaching profession; hence the need for students in education subject disciplines to rise up to challenges by improving their level of computer competence.

Similarly, teachers willing to retain their slots in the prestigious career must take steps to acquire the skills to cope and meet the needs of various students in the classrooms in this age of technology growth.

**Conclusion and Recommendations**

This study investigated the contributions of computer efficacy, computer use, and computer phobia to Nigerian undergraduates' academic performance in a computer graphics course. To enhance good performance in computer related courses in institutions of higher learning, stakeholders of the education industry would need to reconsider developing students' computer usability skills in order to maximise the potential of the technological facilities for academic benefits and possible reduction of un-necessary anxiety.

The results of this study indicate the essential significance of computer use and efficacy as antidotes to exercise fear towards accomplishing given academic tasks via the computer. The realisation of the potential of good quality of visual instructional resources is gaining more ground in the field of education in view of continuous advancement in Information and Communication Technology and the available graphics software. In Nigeria, for educators to motivate students' unrestrained attempt to use computers "meaningfully" to reflect improved standard of education for a better tomorrow; the following are recommended:

- A practically-oriented and students-centred introduction to computer course should be made a minor, but a must-do for all students at the first year of their programmes in the university so as to expose them to early acquisition of the needed computer skills, knowledge and build the necessary computer confidence in them;
• Efforts should be made to ensure that every student has unrestricted access to computers in the school without taking turns;

• All education students need to produce visual aids for use during teaching practice; therefore previous computer skills, knowledge and experiences should be major pre-requisites to admitting students not only into computer education programme, but also into all programmes in the faculty of education;

• Government and higher institution authorities should establish and enforce rules that would compel lecturers to adopt computer technology-oriented methods for instructional purposes;

• Authorities of institutions of higher learning should endeavour to establish and operate functional and standard computer-cluster rooms at campus’s strategic points. This would reduce the number of hours students spend at the cyber-cafes to queue for turn-taking over computer use as well as the hours spent on unnecessary chatting, viewing inappropriate materials, etc.;

• Authorities of various universities should try as much as possible to ensure that students have unrestricted access to computer cluster rooms for a chunk of hours (day and night);

• Higher institution authorities should endeavour to encourage online lecturer and students interaction for discussion, submission of assignments, and other related academic activities in order to assist the “computer-weaklings” get out of their web of anxiety towards using computers;

• Computer graphics as a course should be seen and taught as a practical-oriented course rather than lecturers white-washing its value, quality of teaching and learning in mere traditional classrooms that are deficient of the needed technological supports; and

• Computer-counselling centre should be established in each of the faculties of all universities so as to encourage students who are computer-phobic to overcome technology anxiety, save their academic career from sudden collapse and provide succour to already frustrated students.

Suggestions for Further Research

This study is limited to an institution in one of the states in the south-western of Nigeria, thus it has not covered all possible information on the prediction of computer efficacy, computer use, and computer phobia on students’ academic performance in computer graphics. Therefore, the researcher urges academics to conduct further research on this subject matter focusing on other courses or modules, private higher institutions, a wider geographical coverage, and other regions aside Ogun state and South-Western part of Nigeria. More importantly, there is the need to research into how enrolment in a Computer Graphics course has influenced some other predictive variables in the use of computers.

References


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