

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 could predict the level of students' academic performance in a Computer Graphics course. A total of 189 undergraduates of Olabisi Onabanjo University, Nigeria, served as the sample for the study. The study sample responded to four instruments: Computer Self-Efficacy Scale, Computer Use Scale, Computer Phobia Scale (CPS), and Computer Performance Test. Data were analyzed using Pearson Product Moment Correlation, Multiple Regression, and Analysis of Variance. The findings revealed that the three independent variables, when taken together, were effective in predicting students' academic performance in Computer Graphics course. Meanwhile, each of the independent variables contributed to the prediction of dependent variable. On the basis of these findings, suggestions were made.

(Keywords: computer efficacy, use, phobia, academic performance, grades, computer graphics course)

INTRODUCTION

Developments in Information and Communication Technologies (ICT) have had great impacts upon almost every aspect of human life. Technology is challenging and re-directing much of human activity. To a large extent, Information Technology (IT) is making dramatic impacts in the education industry (Groves and Zemel, 2000; Khorrami-Arani, 2001). In view of the demands of the labor-market, institutions of higher learning in developing countries such as Nigeria are striving towards making institutional environments ICT compliant to gain more effectiveness in the teaching and learning processes. Sam, Othman,

and Nordin (2005) noted that the recent trends in instructional processes are undergoing immeasurable alteration and transformation through the convergence of computer technology advancements and innovations.

Sax, Astin, Korn, and Mahoney (1998) pointed out that computer technologies have become students' inevitable tools for assignments, making study notes, accomplishing self-organized tutorials, research project data processing, and easy and fast communication. Since the use of IT for teaching and learning in higher institutions are numerous and computers have become a great force in the labor market, it becomes important for students to have a relatively high degree of computer proficiency (Stout and Lee, 2004). In computer related courses such as Computer Graphics (CG), it is expected that students possess a wide range of computer proficiencies for academic excellence.

CG is an evolving technology. Recent advances in computer technology have expanded the scope of applications of graphics in the education sector (Nzeako, 1989). CG has become one of the growing exciting fields in the computer revolution and as it finds its way into the education industry, it is almost taking over the traditional methods of instructional materials production (Ekhami, 2007; Nzeako, 1989).

CG involves an exposure to both the artistic and computer skills needed to successfully stand-out in the field of digital arts. Among its applications are: video games/entertainment software, paint systems, Computer Assisted Design (CAD), animation and television, advertising, and multimedia instruction. CG enhances the technical capacity of computer education students because it helps them to build the right attitude towards understanding and appreciating the

qualities of visual aids produced via computers because qualitative visual presentation holds a degree of sensible face validity in instructional process (Eber and Wolfe, 2000).

Smith (2001) and Torkadesh and Dwyer (1994) stated that students' levels of interaction with computers are sometimes dependent on variables like gender, self-efficacy, self-concept, computer anxiety, computer confidence, and computer experience.

Computer Self-Efficacy (CSE) theory has been derived from Bandura's Self-Efficacy construct, hence it forms the theoretical basis for understanding technology integration into instruction (Antonacci, 2002). Computer Self-Efficacy refers to self-confidence in one's ability to make use of computers (Compeau and Higgins, 1995; Smith, 2001). In other words, CSE is the individual's self-judgment about the ability to use the computer to accomplish given tasks based on the computer-related experiences (Doyle, Stamonli and Huggard, 2005; Faseyitan, Libii and Hirschbuhl, 1996; Oliver and Shapiro, 1993; Smith, 2001). Summarily from the above, CSE is the confidence one has in one's ability to execute target or given task via the computer system. Critically viewed, CSE cannot be based only on experience or level of skill acquisition, but rather it is considered as an outgrowth of self-visualized capability.

Academic researchers have delved into the influence of self-efficacy (SE) on varied performances:

- Hackett (1989) 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 demonstrated greater enthusiasm towards enrolling in computing courses than those with lower beliefs (Zhang and Espinosa, 1998)
- CSE is a significant factor in differentiating adopters and non-adopters of technology (Faseyitan, Libii and Hirschbuhl, 1996)

This is why Webster and Martocchio (1992) posited that the higher the computer self-efficacy, the better individuals are likely to be positively

disposed to using the computers. Similarly, Smith (2001) argued that students with high level of CSE are in a vantage position of learning new concepts via computer and are likely to expend less effort towards utilizing computers. Meanwhile, Ellen, Bearden, and Sharma (1991) reported that 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 has gained more ground. Computer use encapsulates elements like the amount of hardware and software available, computing time for student usage, and the frequency of technology useage. Unfortunately, Rieber (2005) noted that in many developing countries, educators often give accounts for the full number of computers they have available in the schools, but the extent to which they are actually used by the students and even the faculty is another matter. Studies have shown that an individual's attitude along with the frequency of computer use is influenced by the level of their confidence and state of enjoyment (Gressard and Loyd, 1986). Smith (2001) however reported that an individual's computer experience based on computer usage determines the level of belief in their skills and confidence about using computers to accomplish tasks.

Computer Phobia (CP) is a symptom of modern times induced by the frequently and rapidly changing nature of technology. Brosnan and Davidson (1994) reported that almost one third of individuals within most populations exhibit a certain degree of computer phobia. CP and computer anxiety are interchangeably used to describe the fear of impending interaction with a computer that is disproportionate to the actual challenge presented by the computer's use (Chua, Chen and Wong, 1999; Rosen and Weil, 1992). CP; "a real phenomenon" according to Doyle, Stamonli, and Huggard (2005) is a psychological response definition of the term computer anxiety. Individuals who are "computer-phobic" display negative behavior and physiological reactions to computers, including use of computer for a limited time, negative comments about computer, avoidance of computer usage, etc. (Anderson, 1996; Bandura,

1997; Becker and Schmidt, 2001; Bozionelos, 2001).

Research findings indicate that:

- High computer anxiety is similar to detracting cognitive resources from task performance (Kanfer and Heggested, 1997)
- Women tend to be more computer phobic than men (Levin and Gordon, 1989; Weil and Rosen, 1995)
- Older people have higher level of computer phobia than younger ones (Laguna and Babcock, 1997)
- Individuals who are “techno-phobic” are subjected to off-tasks efforts which lead to worrying about performance, spend longer time on tasks with errors (Darke, 1988)
- There is a relationship between low level of computer anxiety and high scores in examinations (Doyle, Stamonli & Huggard, 2005)
- Students who possess elements of CP feel reluctant to use computers and consider working with computer a daunting prospect (Weil and Rosen, 1995)
- Education is negatively related to computer anxiety and external locus of control (Igbaria and Chakrabarti, 1990).

In the light of the above, it is suffice to say that CP limits individual's competence in the use of computer to accomplish given tasks.

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 individual's level of computer use. Marakas, Yi, and Johnson (1998) did highlight the complexity of computer self-efficacy construct, but solicited further research. Doyle, Stamonli, and Huggard (2005) argued that the relationship between computer anxiety, CSE, and computer experience in students depends on the nature of the students under investigation.

Nigerian schools were very late in the up-take of IT and ICT for instructional purposes; hence the

need for the review and assessment of learners' effective use of the computers vis-à-vis their academic performances. However, there seems to be little or no research related to Nigerian computer graphics students' computer competence and the extent to which variables like CSE, computer use, and computer phobia can relatively or jointly predicted their performance in computer graphics courses. These variables are central to good academic achievement in a graphics course in the sense that excellence is possibly determined and measured by the level of computer competence. The purpose of this study was to investigate the predictive levels of computer self-efficacy, computer use and computer phobia on the student's academic performance in computer graphics course.

RESEARCH QUESTIONS

To achieve the objective of this study, two research questions were formulated:

1. What is the joint contribution of computer self-efficacy, computer use, and computer phobia to the prediction of student's academic performance in computer graphics course?
2. What is the relative contribution of computer self-efficacy, computer use, and computer phobia to the prediction of students' academic performance in computer graphics course?

METHODOLOGY

Design

The study adopted the descriptive research design to find out the prediction of the criterion variables on the student's performance in computer graphics course.

Participants

Participants in this study were 189 (males 112 = 59.25%; females 77 = 40.74%) full time computer education students of Olabisi Onabanjo University, Nigeria. The students were enrolled in an introductory computer graphics course coded CST 405. In spite of the nature of the program the participants who were admitted for and enrolled in the university had limited first-hand exposure to for the practical use computers outside of the in-

class learning that was part of this course. The mean age and the standard deviation of the respondents were 23.6 years and 8.75, respectively.

Instruments

Computer Self-Efficacy Scale (CSES): CSES was developed by Gürcan (2005) to measure university students' computer self-efficacy. It was used to measure participants' confidence in their ability to perform specific computer task activities. The instrument has 27 items. Participants were asked to rate their level of confidence on the 5-point Likert format (ranging from 1= not confident to 5 = completely confident). For this study, the Cronbach Alpha Coefficient of the instrument was 0.78.

Computer Use Scale (CUS): This is a self-designed scale. The scale is a 6 item instrument measuring participants' frequency level of computer use. Examples of the item included in the instrument are: "On average, how many hours a week do you spend working on computers?" and "How often do you use computers for specific tasks or activities?". Participants were asked to respond to each of the items based on their level of computer use. The validity of the instrument was ensured through its critical examination by experts in test-item construction. Comments of the experts were considered before the production of the final draft. Meanwhile, the scale has a reliability index of 0.81 through test re-test method carried out within two weeks.

Computer Phobia Rating Scale (CPS): The students' computer phobia was measured by using the Computer Anxiety Scale developed by Ceyhan and Namlu (2000). The CPS consists of 28 items, which required an answer of "never", "sometimes", "frequently", and "always". The word "anxiety" in the adopted instrument was replaced with "phobia". The tool elicited information about participants' feeling of competency and anxiety with respect to computer usage. The participants responded on a 4-point Likert scale (from strongly disagree = 1, to strongly agree = 4). The initial internal consistency of the scale items was found to be .94, but for this study, the Cronbach Alpha Coefficient of the instrument was .87.

Computer Performance Test (CPT): In line with the Computer Self-efficacy Scale, the CPS was designed to measure students' computer tasks

performance using some software. Participants were asked to produce documents in accordance with the items of the CSES. For example, the participants were provided with a hardcopy of a conference announcement poster and later asked to produce a flier of the poster using Corel Draw 11 or 13 and PowerPoint presentations. Each participant had the opportunity to earn a maximum of 50 marks. The performance of the participants were assessed with due consideration for the appropriate application of the principles of design (balance, rhythm, variation, dominance, unity/harmony, and proportion) in the design out-put.

Face and content validation of the instrument was determined by four experts of fine-arts, graphic design, test and measurement, and educational technology. The original structure and content of the instrument was reviewed, criticized, and the comments were given due consideration before the final draft. The reliability of the instrument was determined through a test-retest method within two weeks interval. A reliability coefficient of 0.79 was obtained through Pearson Product Moment Correlation analysis and this was considered adequate for this study.

Procedure for Data Collection

During a regular class session, the participants first completed the Computer Self-Efficacy, Computer Use, and Computer Phobia Rating Scales. In the following class, the Computer Performance Test was administered to the participants. All the instruments were completed within the last five teaching-days in the first semester. CST 405 was a one semester course which runs 2 hours per week.

Data Analysis

The data were analyzed using Pearson Product Moment Correlation, multiple regression and Analysis of Variance.

RESULTS

In this study, two main issues were addressed. The first one was to know the extent of the contribution of computer self-efficacy, computer use, and computer phobia in the prediction of students' academic performance in computer

graphics course. The second issue of concern was to find out the variable that made the greater contribution to the prediction of the dependent variable. The results of the data analysis are presented below. The results of the data analysis indicating the mean and standard deviation of all variables are shown in Table 1.

The results of Table 1 indicate the means and standard deviations of the responses of the participants. The respondents' values for computer phobia were $M= 43.4815$, $SD= 7.07052$; computer efficacy were $M= 54.9577$, $SD= 6.25166$; and computer use were $M= 55.4127$, $SD= 7.16441$. Meanwhile, the matrix of correlation between the three independent variables (computer efficacy, computer use and computer phobia) and the criterion variable (academic performance in computer graphics course) is shown in Table 1.

Academic performance correlated positively and significantly with computer efficacy (0.400) and computer use (0.596), but negatively and significantly correlated with computer phobia (-0.449). Computer phobia correlated significantly but negatively with students' academic performance, computer efficacy and computer use (-0.449; -0.386; -0.502). Computer efficacy significantly and positively correlated with

students' academic performance (0.400) and computer use (0.395), but significantly and negatively correlated with computer phobia (-0.386). Computer use significantly and negatively correlated with computer phobia (-0.502), but significantly and positively correlated with students' academic performance (0.596) and computer efficacy (0.395).

The results presented in Table 2 indicate that the independent variables (computer self-efficacy, computer use and computer phobia) when put together yielded a coefficient of multiple regression (R) of 0.637 and a multiple correlation square of 0.406. This shows that 40.6% of the total variance of the participants' performance in computer graphics is accounted for by the combination of the three variables. Furthermore, the table also indicates that the analysis of variance of the multiple regression data produced an F-ratio value significant at 0.05 level ($F(3,188) = 42.095$; $P < 0.05$).

To determine the contribution of the three independent variables in the prediction of students' academic performance in a computer graphics, a stepwise regression analysis was taken and the results are shown in Table 3.

Table 1: Descriptive Statistics and Correlations Matrix for the Relationship between the Predictor Variables and the Criterion Variable.

Variables	Mean	Std. Dev.	Academic Performance	Computer Phobia	Computer Efficacy	Computer Use
Academic Performance	56.4815	8.17013		-.449*	.400*	.596*
Computer Phobia	43.8466	7.07052	-.449*		-.386*	-.502*
Computer Efficacy	54.9577	6.25166	.400*	-.386*		.395*
Computer Use	55.4127	7.16441	.596*	-.502*	.395*	

Table 2: Summary of Multiple Regression Analysis between the Predictor Variables and the Criterion Measure.

Multiple R (Adjusted) = .637; Multiple R ² (Adjusted) = .406; Stand error estimate = 6.34934					
Source of variation	df	Sum of Squares	Mean Square	F-Ratio	P
Regression	3	5091.080	1697.027	42.095	<.05
Residual	185	7458.105	40.314		
Total	188	12549.185			

- a. Predictors: (constant), computer use, computer efficacy, computer phobia.
 b. Dependent Variable: students' performance in computer graphics.

Table 3: Stepwise Multiple Regression Analysis Model Summary and Analysis of Variance of the Predictor Variables and the Criterion Variable.

Model	R	R ²	Adjusted R ²	Std. Error of Estimate	Change Statistics				
					R ² Change	F Change	df1	df2	Sig. F Change
a	.596	.355	.352	6.57756	.355	103.059	1	187	.000
b	.622	.387	.381	6.42895	.032	9.745	1	186	.002
c	.637	.406	.396	6.34934	.018	5.694	1	185	.018

- a. Predictors: (constant), computer use.
 b. Predictors: (constant), computer use, computer efficacy.
 c. Predictors: (constant), computer use, computer efficacy, computer phobia.

The results in Table 3 revealed that computer efficacy, computer use, and computer phobia significantly predict undergraduates' performance in computer graphics course. When computer use was entered into the model as the first predictor variable based on the strength of relationship with students' performance in computer graphics course, R² change accounted for 35.5% of the students' performance in computer graphics (F1, 187 = 103.059, R = 0.596, R² = .355; P > 0.05). Meanwhile, when computer efficacy entered into the model as the second predictor, there was a contribution of 3.2% to the students' performance in computer graphics (F2, 186 = 9.745, R = 0.622, R² = 0.387; P < 0.05). With computer phobia entering the model, a significant prediction of 1.9% was also revealed (F3, 185 = 5.694, R = 0.637, R² = 0.406; P < 0.05). This revealed that the three predictor-variables together predicted 40.6% of the variation if the students' performance in computer graphics.

The data were subjected to further analysis using Multiple Regression Analysis (MRA) with all the variables entered into the model at the same time to determine the relative contribution of the predictor variables; computer efficacy, computer use and computer phobia to the criterion variable; students' academic performance in a computer graphics course. Results of the MRA analysis that was tested at 0.05 significance level indicating the Beta coefficients and t-ratio are presented in Table 4.

Results presented in Table 4 show that computer use ($\beta = -0.453$, $t = 6.684$, $P = < 0.05$) was the potent predictor of the students performance in computer graphics. Meanwhile, computer efficacy ($\beta = 0.159$, $t = 2.506$, $P = > 0.05$) also made an insignificant contribution to the prediction of the students' performance in computer graphics course, when computer phobia ($\beta = -0.161$, $t = -$

2.386, $P = > 0.05$) made the least contribution to the prediction of the outcome measure. This was done to provide evidence of relative importance of the independent variables in accounting for the variations in students' academic performance in computer graphics course.

DISCUSSION

One of the major 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 the 0.05 level is quite good evidence that the combination of the independent variables in the prediction of students' performance in computer graphics would not be by chance. The fact still remains that the coefficient of multiple regression of 0.637 and a multiple R square of 0.406 is an indication of the magnitude of the relationship between the independent variable and the criterion variables.

Drawing inference from the data in Table 2, it is evident that a linear relationship of the three predictor variable accounted for 40.6% of the total variance in the Nigerian undergraduates' performance in computer graphics course.

The outcome of this study contradicts the findings of Kasten and Roth (1998) who found no relationship between computer self-efficacy, computer experience, and performance in IS course. However, the results of this study share common boundaries with Hoffman, Kalsbeek, and Novak (1996) cited in Hunley, Evans, Delgado-Hackey, Krise, Rich, and Schell (2005) who found strong relationship between computer use, and higher educational aspiration, and Bandura (1997), Anderson (1996), and Garland and Noyes

Table 4: Coefficient and t-Value of the Regression of the Predictor Variables to the Students' Academic Performance in a Computer Graphics Course.

	Un-Standardized Coefficient		Standardized Coefficient	t ratio	P
	B	Std. Error	B		
(constant)	24.608	7.783		3.162	0.002
Computer Use	0.516	0.077	0.453	6.684	0.000
Computer Efficacy	0.208	0.083	0.159	2.506	0.013
Computer Phobia	-0.186	0.078	-0.161	-2.386	0.018

a. Dependent Variable: students' performance in computer graphics.

(2004) who reported that self-efficacy, computer anxiety, and computer experience, collectively, have influence on how students approach the use of computers. The outcome of this study could be accounted for by the fact that few Nigeria undergraduates; even those offering courses that are computer related, are introduced to the use of computers for academic purposes at the later part of their stay in the university, while many never had such essential opportunity. As a matter of fact, a lot of the computer knowledge and confidence demonstrated by students in school are more than often acquired accidentally by trial and error interaction with computers in the public cyber-cafes and conscious efforts to learning from friends informally.

Computer use was a strong predictor of the criterion variable as revealed in Table 3 ($F_1, 187 = 103.059$, $R = 0.596$, $R^2 = .355$; $P > 0.05$). 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 additional 1.9% to the prediction of the variance in Nigerian students' performance in computer graphics.

The outcome thus tilts towards the findings, opinions, and assertions of previous research: student's frequent use of computers correlates

with performance in computing (Saleh, 2007); computer access and frequent use of computers correlates with students' higher test-scores (Attewel, Paul, & Battle-Juan, 1999; Bussiere & Gluszynski, 2004); and students achieve higher scores when they intensively use computers (Senkbeil & Wittwer, 2007). The finding of this study indicated that computer use's contribution to the criterion variable was not too low and at the same time not highly encouraging ($R^2 = 0.355$; $P > 0.05$). It is therefore obvious that the frequency of computer use may not always be proportionate with student's academic performance, but rather the purpose and quality of its frequent use. It is therefore glaring those students who study humanities and arts; and thus foresee no relevant use of computers in their academic pursuits and careers in the future often tend to be complacent about acquiring computer skills and knowledge except those who naturally have flair for technology exploration.

Computer efficacy is also a significant predictor of undergraduates' performance in a computer graphics course. Tella and Tella (2003) reported that self-efficacy is a better predictor of academic performance, while Gist, Schwoerer and Rosen (1989) reported that computer use and efficacy positively relates to higher learning performance. The outcome of this study is an indication that many students who do not have undisrupted access to computer tend to regard themselves as "computer handicaps" when confronted with performing tasks using computer especially in the public. This inferiority complex on the part of "computer-weakling-students" probably explains why the number of enrolment in computer related courses in the faculty of education in many Nigerian universities is often low and dwindles

with time. Meanwhile, Kasten and Roth (1998) found that computer use and computer efficacy positively correlates with performance in introductory courses. The outcome of this study further showed that computer efficacy has a relationship with Nigerian students' performance not only in introductory courses, but also in the core courses (such as computer graphics, instructional technology) which are paramount to education students who needed to apply the knowledge gained in the course(s) on the field of practice during exercises such as teaching practice.

The results further indicated that computer phobia had 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 their level of computer anxiety. By the outcome of this study, it could be inferred that students who are extroverts compared to their introvert-counterparts in the class may have fewer burdens about accomplishing tasks using computers; hence their academic performance could be encouraging and commendable in view of their high level of inquisitiveness and interest in environmental exploration. This is basically 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 are confident about their ability to effectively utilize the computer to accomplish given tasks are not likely to exhibit traits of fear, anxiety and nervousness about using computer effectively. As a matter of fact, such students are not likely to yield to one of the un-productive strategies to computer usage (avoidance, fake trial, fidgeting, un-due tension and profuse sweating, lack of concentration, last number turn-taking, seeking un-necessary assistance, etc.).

CONCLUSION AND RECOMMENDATIONS

This study investigated the level of prediction of computer efficacy, computer use, and computer phobia on Nigerian undergraduates' academic performance in a computer graphics course. To enhance good performance in computer related courses in institutions of learning, stakeholders of the education industry would need to reconsider

developing students' usability skills in order to maximize the potentials of the technological facilities for academic benefits, better performance and possible reduction of unnecessary anxiety.

The results of this study indicate the significance of computer use and efficacy in reducing fear towards accomplishing given academic tasks via the computer. This eventually yields positive and improved academic performance in computer-based courses. The realization of the potentials 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 currently available graphics software packages. In Nigeria, for educators to motivate students' unrestrained attempts, computers must be used in a "meaningful" way and the standard of computers used in education must be improved for a better tomorrow; the following recommendations are suggested:

- Introduction to computer courses should be made a minor, but a mandatory course, for all students at the first year of their programs in the university so as to expose them to early acquisition of the needed computer skills and knowledge, and to help them build necessary computer confidence;
- Since all education students need to produce visual aids for use during teaching practice; previous computer skills, knowledge, and experiences should major prerequisites to admitting students not only into computer education programs, but also into all programs in the faculty of education;
- Government and higher institution authorities should establish and enforce rules that would compel lecturers to adopt Computer Assisted Learning method for instructional purposes;
- Authorities of institutions of higher learning should endeavor to establish and operate functional and standard computer-cluster rooms across the campus's strategic points. This would reduce the number of hours students spend at the cyber-cafes to queue for turn-taking over computer's use as well as the hours spent on unnecessary chatting, watching of pornographic 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 significant block of hours (day and night);
- Higher institution authorities should endeavor to encourage online lecturer and student interactions for discussion, submission of assignments, and other related academic activities in order to assist less skilled computer users to build confidence in their ability to use computers;
- Computer graphics, as a course, should be seen and taught as a practical-oriented course rather than as just lecturers; white-washing its value, quality of teaching, and learning in mere traditional classrooms that are deficient of the needed technological supports;
- Computer-counseling centers 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 support to the already frustrated students.

SUGGESTIONS FOR FURTHER RESEARCH

This study is limited to an institution in one of the states in the south-west Nigeria, thus it has not covered all possible information on the prediction of computer efficacy, computer use, and computer phobia on all students' academic performance in computer graphics. The researchers urge 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 outside of Ogun state and the South-Western part of Nigeria. More importantly, there is the need to research how enrolment in a computer graphics course has influenced some other predictive variables in the use of computers.

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SUGGESTED CITATION

Agbatogun, A.O. and B. Banjo. 2010. "Computer Efficacy, Use, and Phobia: Contributions to Nigerian Undergraduates' Academic Performance in a Computer Graphics Course". *Pacific Journal of Science and Technology*. 11(1):362-372.



[Pacific Journal of Science and Technology](http://www.akamaiuniversity.us/PJST.htm)