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Effects of Computer Self-Efficacy on Pre-Service Art Teachers' Achievement in Graphic Design

Onwuagboke, B. B. C.* and Singh, T. K. R.

School of Educational Studies, Universiti Sains Malaysia, Pulau Pinang, Malaysia

ABSTRACT

This paper investigates the effects of computer self-efficacy beliefs of pre-service teachers on their achievement in graphic design theory and practical design. The study adopted a quantitative research approach using non-equivalent groups' pre-test-post-test quasi-experimental research design. A sample of 81 participants was purposively drawn from second-year pre-service art teachers in colleges of education in Nigeria. Three research questions and three hypotheses were formulated to guide the study. The research instruments used were computer self-efficacy scale adopted from the literature, teacher-made graphic design achievement tests and a graphic design assessment rubric developed by the researchers. Data collected from the study were analysed using inferential statistics and Analysis of Covariance (ANCOVA). The findings showed that computer self-efficacy beliefs of the pre-service teachers had a positive effect on their achievements as those with high computer self-efficacy beliefs performed better than those with low computer self-efficacy beliefs in all the groups in overall graphic design and practical graphic design achievement. However, their self-efficacy beliefs were found to have no significant effect on their theory achievements. It was concluded that teacher educators should endeavour to help pre-service teachers develop high computer self-efficacy beliefs to enable them to benefit maximally from ICT-integrated curricula.

Keywords: Computer self-efficacy, pre-service teachers' achievement, graphic design

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E-mail addresses:
bbconwu@gmail.com (Onwuagboke, B. B. C.),
termitk@gmail.com (Singh, T. K. R.)
* Corresponding author

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INTRODUCTION

The use of computers in the learning environment and indeed by present-day society is a reality that has come to stay. The world we live in is so fast-paced that it requires the daily transfer of information at the same pace (Magliaro & Ezeife,

2007). Consequent upon this, the use of computer application in the routine activities of teacher educators and pre-service teachers in teacher-education institutions all over the world has been on the increase. To keep abreast with the demands of technology integration in the curriculum, Magliaro and Ezeife (2007) maintained that teachers should not only be responsible for delivering content to learners, but must also develop new ways of teaching and learning. Integration of computer use in the curriculum is a teaching innovation brought about by technological development in the 21st century, and both serving teachers and pre-service teachers are expected to have efficacy of computer use.

The Nigeria Certificate in Education (NCE) is the minimum certificate required for teaching in Nigeria. Colleges of education are responsible for training NCE teachers for the education sector. Over the years, there have been continuous remarks from government quarters and the public on the declining standards of education. Most of the NCE teachers in the school system lack basic ICT competencies to integrate ICT in their subject areas. For this reason, the federal government of Nigeria started restructuring the NCE curriculum to enable the graduating students to meet the challenges of teaching in the 21st century classroom (Akande & Olorundare, 2011).

In art teaching, especially at the teacher education level, there is need for integration of information and communication technology (ICT) both as a teaching and learning tool. The federal republic of Nigeria in its minimum standards for Nigeria Certificate in Education (NCE) teachers stipulates that computers and computer laboratories should be provided and used in teaching (FGN, 2009). This is most especially required in the field of teaching and learning graphic design, a subject that has virtually become impossible to teach and learn effectively in this digital age without computers (Yeoh, 2002). A major challenge to the integration of ICT into the curriculum of teacher education institutions in Nigeria is the inadequacy of available computers for instructional purposes coupled with lack of skills and competencies required for implementing the same in the instructional process. In effect, ICT is not properly integrated in teaching teachers, making it difficult for them to use ICT in their own teaching practice. This has led to the predominance of teaching graphic design in theory without proper hands-on activities (Aladejana, 2006; Ogunduyile, 2008; Ametordzi, Osei-Poku, & Eshun, 2012).

The result of this challenging situation is that even if computers are sufficiently available for instruction in teacher-education institutions, pre-service teachers may not use them in their learning and internship as their teachers rarely use them. The majority of them have the belief that they are not adequately trained in the use of technology in the classroom; in addition, available technological tools seem inappropriate (Hardy, 2003; Kalu & Ekwueme, 2010). There is the need to integrate ICT in their learning environment to enable them to increase their computer self-efficacy beliefs.

Thus, if opportunities to learn and teach with ICT are lacking, they may develop computer phobia, which would culminate in these pre-service teachers having low computer self-efficacy belief. Low computer self-efficacy belief has been found to affect academic achievement negatively by scholars (Tsai & Tsai, 2003; Agbatogun & Banjo, 2010).

Self-Efficacy

Social cognitive theory is the underpinning theory for this study. Self-efficacy is a concept that stemmed from social cognitive theory and expresses one's belief in being able to perform a particular task to achieve a certain outcome (Bandura, 1997). The theory explains that one of the most powerful ways through which students learn is through observation of behaviours modelled by those around them. Social cognitive learning theory explains human behaviour in terms of continuous reciprocal interaction between cognitive, behavioural and environmental influences. Self-efficacy is defined as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p. 391).

This belief about one's capacity to succeed in a task is influenced by four major factors, which are:

i. past performance
ii. modelling
iii. verbal persuasion
iv. psychological state (Bandura, 1986).

Of these four factors, a person's successful past performance on a task similar to the task at hand is the most influential factor in self-efficacy (Eggen & Kauchak, 2007). Modelling follows in that hierarchy, as an individual's self-efficacy increases as he/she observes another individual performing the expected task successfully. This is followed in that order by verbal persuasion, which has the tendency to encourage individuals to do tasks. At the bottom of the influence ladder is psychological states like hunger, stress, fatigue and anxiety. They have the capacity to influence the self-efficacy beliefs of a person, giving the feeling of incapability in handling a task (Albion, 1999; Scholz et al., 2002).

It is a motivational factor that greatly impacts students' choice of learning activities and the amount of effort they attribute to learning in the classroom (Linnenbrink & Pintrich, 2004; Mikropolous & Natsis, 2011) and while pursuing individualised learning outside the classroom. Thus, self-efficacious students are more likely to undertake more challenging learning tasks and to persevere in difficult situations than their peers. Self-efficacy is central to promoting students' engagement and learning (Sun & Rueda, 2012) as a student's self-efficacious beliefs motivate him to try harder in order to succeed in any given learning task.

Self-efficacy has been identified as a key factor in developing competence in any human endeavour (Bandura, 1993). It plays a mediatory role between beliefs and behaviours. Scholars have stated that

learners with a high sense of self-efficacy show strong achievement, whereas the opposite is the case for learners with a low sense of self-efficacy (Schunk, 1981; Skaalvik & Skaalvik, 2006). The result of this is that the higher the self-efficacy belief of a student, the longer they tend to persevere on a task (Pajares, 2003). Individuals who see themselves as capable of doing certain activities are classified as being high in self-efficacy and are more likely to attempt and accomplish such activities whereas those who see themselves as less capable are less likely to attempt and do such activities and are accordingly classified as lower in self-efficacy (Bandura et al., 1977; Barling & Beattie, 1983).

Scholars have investigated and found academic self-efficacy to be one of the most important predictors of students' academic achievement (Jinks & Lorsbach, 2003; McPherson & McCormick, 2006; Nelson & Ketelhut, 2008). Learners who are self-efficacious feel confident about solving problems as they have developed an approach to problem solving that worked in the past (Wahab & Hj, 2012). Self-efficacy was found to have influenced academic achievement directly as well as indirectly by raising students' grade goals (Zimmerman et al., 1992).

Computer Self-Efficacy

Computer self-efficacy has been seen as an individual's self-judgment about his/her ability to use the computer to accomplish given tasks based on computer-related experiences of the individual (Oliver & Shapiro, 1993; Faseyitan et al., 1996; Smith, 2001; Doyle et al., 2005). It is an off-shoot of Bandura's self-efficacy construct that forms the theoretical basis for understanding technology integration into teaching and learning (Antonacci, 2002). The impact of computer self-efficacy in learning has been highlighted and investigated by scholars who developed and validated the computer self-efficacy scale (Murphey et al., 1989; Torkzadeh & Koufteros, 1994; Compeau & Higgins, 1995), most especially within computer competency investigations. To the best of the knowledge of researchers, not much has been done on this in the Nigerian context with regards to teacher preparation institutions and how it affects academic performance. Therefore, this study examined its effect in making learners benefit from instructions in which computers and computer applications are used both as a medium as well as a tool to construct learning.

To achieve the objectives of the study, the researchers set out to determine if there was any difference in the mean post-test scores in overall graphic design achievement scores between a perceived high computer self-efficacy group and a perceived low computer self-efficacy group in their response to teaching with ICT Integrated Studio Teaching Model (IISTM). The researchers also wanted to ascertain if there was any difference in the mean post-test scores in graphic design theory achievement scores between the perceived high computer self-efficacy group and the perceived low computer self-

efficacy group in their response to teaching with IISTM. The final objective was to find if any differences existed in the mean post-test scores in practical graphic design achievement scores between the perceived high computer self-efficacy group and the perceived low computer self-efficacy group in their response to teaching with IISTM.

In the same vein, the following corresponding alternative hypotheses were postulated.

Ha_1 There is significant difference in overall graphic design achievement means scores between the high computer self-efficacy and the low computer self-efficacy groups of pre-service art teachers taught using the ICT integrated studio teaching model.

Ha_2 There is significant difference in graphic design theory achievement means scores between the high computer self-efficacy and the low computer self-efficacy groups of pre-service art teachers taught using the ICT integrated studio teaching model.

Ha_3 There is significant difference in graphic design practical achievement means scores between high and low computer self-efficacy groups in the three intervention groups of pre-service art teachers taught using the ICT integrated studio teaching model.

MATERIALS AND METHODS

The study adopted a quantitative research paradigm to find answers to the research problem and to test the research hypotheses. The study was designed as a quasi-experimental study using non-equivalent comparison-groups' pre-test-post-test design. A sample of 81 second-year pre-service art teachers from three intact classes was purposively drawn from Fine and Applied Arts departments in colleges of education in Nigeria. Three colleges of education were selected from the 67 government-owned colleges based on the fact that they have well established Fine and Applied Arts departments, ICT laboratories with internet connection and a second-year student enrolment of not less than 25 students. Balloting was used to select three colleges from the six colleges that met the criteria. College 1 had 28 students, College 2 had 27 students while College 3 had 26 students, giving a total of 81 participants.

Graphic design is a course in fine and applied arts curricula in colleges of education in Nigeria that involves the use of a combination of texts and visuals with skills and technological knowledge to communicate ideas and messages from a designer to an audience. Graphic design is made up of theory and practice (Arslan, 2012). Graphic design theory is seen as the body of knowledge and a set of general principles and rules that govern, explain and direct graphic design practice as well as account for effective graphic communication. On the other hand, graphic design practically embraces all follow-

up hands-on activities that involve the application of graphic design theories and principles towards solving specific design problems in the classroom.

Three research instruments were employed in the study to collect data. They were:

1. A computer self-efficacy scale (CSES) adopted from Sam et al. (2005) and developed by Murphey, Coover and Owen in 1989. The pilot testing of the instrument yielded a reliability coefficient of 0.893 on Cronbach's Alpha;
2. The researchers made aGraphic Design Achievement Test (GDAT), which was found reliable with a reliability coefficient of 0.884 using Kudder Richardson's KR-20 run at the parallel model. The GDAT is a 32-item multiple-choice achievement test that covered the topics taught during the experiment;
3. The Graphic Design Assessment Rubric (GDAR) developed by Onwuagboke and Singh (2016) was also employed in assessing practical achievement. The rubric is an analytical rubric which had the following criteria for assessing finished designs produced by the pre-service art teachers: (a) Overall appearance of finished work; (b) Creativity (c) Compositional elements (d) Use of media/technology. The levels of possible quality of products were described without vagueness on a 4-point Likert scale. The rubric was validated using the Intraclass correlation coefficient (ICC). Inter-rater and intra-rater reliability were thus calculated. The inter-rater reliability of the rubric was 0.829 while the intra-rater reliability was computed at 0.924 on Cronbach's Alpha.

The sample was pre-tested using the research instruments and later exposed to three different instructional intervention using the ICT-integrated studio teaching model (IISTM) developed by Onwuagboke, Singh and Fook (2015). The IISTM is a five-phase instructional model designed to integrate ICT in studio teaching. The phases include inspire, demonstrate, explore, implement and critique. In all these phases of the instructional process, various types of ICT were used. The teaching model was designed based on learning theories like modelling/imitation learning (Bandura, 1977), scaffolding (Lev Vygotsky, 1986) and experiential learning (Kolb, 1984).

Research Group 1 comprised 28 participants who were treated to an intervention-tagged Blended Model 1 that involved the use of ICT and ICT experts as resource persons to model the use of ICT as well as to scaffold the pre-service teachers towards achieving learning objectives set by the instructor and peers. The learning was designed to also enable the pre-service teachers to learn using authentic learning experiences. Research Group 2, made up of 27 participants, was, on the other hand, treated to another level of the intervention-tagged Blended Model 2, which had all the features of the first intervention but without ICT experts to act as role models.

The third research group was made up of 26 participants who received an intervention-tagged Blended Model 3 that had no modelling and scaffolding by the instructor and peers but strictly used ICT and authentic learning.

Data collected were keyed into IBM SPSS computer package version 22 for data analysis. A two-way analysis of covariance (ANCOVA) was used to test the research hypotheses. The research variables in this study were computer self-efficacy existing at high and low levels and overall mean achievements of pre-service art teachers in graphic design (theory and practical). The computer self-efficacy scores of the participants were ranked and used to divide the participants into two groups: high and low computer self-efficacy groups.

RESULTS

The mean score of the low computer self-efficacy group in overall graphic design (theory and practical) was computed and compared with that of the high computer self-efficacy group. In Table 1, data presented indicated that there was a difference in overall graphic design means scores between the perceived low computer self-efficacy group and the perceived high computer self-efficacy group. The mean score of the high computer self-efficacy group (55.73) was higher than that of the perceived low computer self-efficacy group (49.46).

Testing Hypothesis 1 (Ha_1)

There is significant difference in overall graphic design achievements means scores between the high computer self-efficacy and the low computer self-efficacy groups of pre-service art teachers taught using the ICT integrated studio teaching model.

To test this hypothesis, a two-way between-groups analysis of covariance was used. The test involved was a 2-by-3 between-groups analysis of covariance. The independent variables were the type of teaching model (Blended Model 1, Blended Model 2 and Blended Model 3) and computer self-efficacy existing at high and low levels. The dependent variable was scores on overall graphic design achievement (OGDA 2) comprising of GDAT 2 and GDAR 2 administered following the completion of the treatment (Time 2). Scores on overall graphic design achievement (OGDA 1)

Table 1
Means Scores of Low and High Computer Self-Efficacy Groups for Overall Graphic Design Achievement 2 (OGDA post-test)

Computer Self-Efficacy	Mean	N	Std. Deviation
Low Computer Self-Efficacy Group	49.4634	41	4.89437
High Computer Self-Efficacy Group	55.7250	40	6.72152
Total	52.5556	81	6.62759

obtained prior to the commencement of treatment (Time 1) were used as covariates to control for individual differences.

Preliminary investigations were conducted to ensure that none of the assumptions of normality, linearity, homogeneity of variances, homogeneity of regression slopes and reliable measurement of the covariate was violated. Levene's test of equality of error of variances was also checked to make sure the assumption of equality of variances was not violated. As indicated in Table 2, the value of the test was 0.148, which is far greater than the 0.05 significance value, meaning it was not significant, which in effect means that the assumption was met.

Table 2
Levene's Test of Equality of Error Variances for Overall Graphic Design Achievement 2 (OGDA post-test)

F	df1	df2	Sig.
1.686	5	75	0.148

The ANCOVA test made adjustments for pre-intervention scores after which there was no significant interaction effect observed. $F(1,74)=0.86$, $p<0.064$, with a moderate effect size (partial eta squared=0.07). Both of the main effects were statistically significant, teaching model: $F(2,74)=20.05$, $p<0.001$; computer self-efficacy: $F(1,74)=50.57$, $p<0.001$. There was no significant interaction effect between the groups and computer self-efficacy as the significance value shown in Table 3 was 0.064, which is above the 0.05 cut-off value. The mean plot in Figure 1 also shows this absence of interaction. The above results suggest that both the low computer self-efficacy and the high computer self-efficacy groups in general responded similarly in Blended Group 1 and Blended Group 2 as can be seen from the gradient of the slopes plotted. However, the high computer self-efficacy group in Blended Group 3 did not seem to benefit as much. The high computer self-efficacy group benefitted more than the low computer self-efficacy group in all the interventions.

A further look at the adjusted mean in Table 4 shows that there was a remarkable difference in the mean scores of the low computer self-efficacy group (M=49.494) and the high computer self-efficacy group (M=55.411). Based on the results presented above, the researchers had enough evidence to accept the alternative hypothesis of a significant difference between the low and high computer self-efficacy groups and state that high computer self-efficacy groups in the three intervention groups seemed to perform better than the low computer self-efficacy groups.

Similarly, the mean scores of the low computer self-efficacy group in graphic design theory was computed and compared with that of the high computer self-efficacy group. As can be seen in Table 5, there was a difference in the graphic design theory mean score between the two groups with the perceived high computer self-efficacy group having a higher mean score of 20.35 compared to the perceived low computer self-efficacy group, which had a mean score of 19.439.

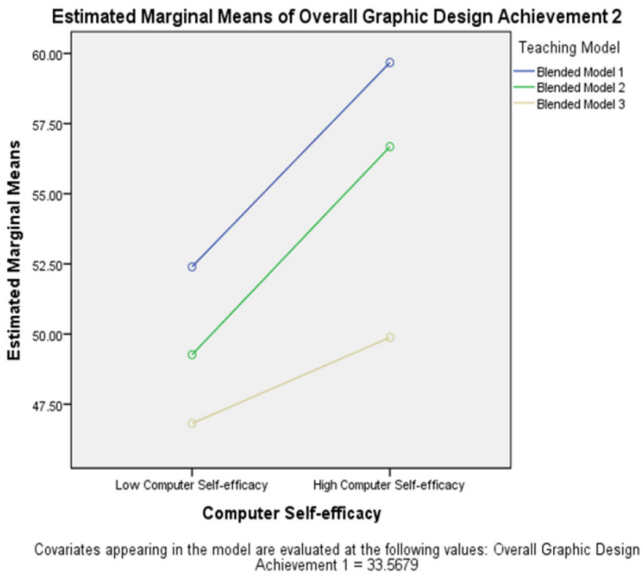

Figure 1. Means plot of estimated marginal means for overall graphic design achievement 2

Table 3
Test of Between-Subjects Effects on Overall Graphic Design Achievement 2 (OGDA post-test) for the Two Computer Self-Efficacy Groups

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2480.202[a]	6	413.367	29.589	0.000	0.706
Intercept	840.367	1	840.367	60.154	0.000	0.448
OGDA1	440.382	1	440.382	31.523	0.001	0.299
Group	755.883	2	377.941	27.053	0.001	0.422
CSE2	706.462	1	706.462	50.569	0.001	0.406
Group* CSE2	79.758	2	39.879	2.855	0.064	0.072
Error	1033.798	74	13.970			
Total	227243.000	81				
Corrected Total	3514.000	80				

Table 4
Estimated Marginal Means Scores Table for Overall Graphic Achievement 2 (OGDA post-test) for the Two Computer Self-Efficacy Groups

		Std.	95% Confidence Interval	
Computer Self-efficacy	Mean	Error	Lower Bound	Upper Bound
Low Computer Self-Efficacy	49.494[a]	.584	48.331	50.658
High Computer Self-Efficacy	55.411[a]	.593	54.230	56.592

Table 5
Means Scores of Perceived Low and High Computer Self-Efficacy Groups for Graphic Design Theory 2 (GDAT post-test)

Computer Self-Efficacy	Mean	N	Std. Deviation
Low Computer Self-Efficacy Group	19.4390	41	3.56405
High Computer Self-Efficacy Group	20.3500	40	4.02269
Total	19.8889	81	3.80132

Table 6
Levene's Test of Equality of Error Variances for Graphic Design Theory 2 (GDAT post-test)

F	df1	df2	Sig.
.665	5	75	0.651

Testing Hypothesis 2 (Ha_2)

There is significant difference in graphic design theory achievement means scores between the high computer self-efficacy and the low computer self-efficacy groups of pre-service art teachers taught using the ICT integrated studio teaching model.

The test involved was a 2-by-3 between-groups analysis of covariance. The independent variables were the type of teaching model (Blended Model 1, Blended Model 2 and Blended Model 3) and computer self-efficacy existing at high and low levels. The dependent variable was the scores on the graphic design theory achievement test (GDAT 2) administered following the completion of the treatment (Time 2). Scores on the graphic design theory achievement (GDAT 1) obtained prior to the commencement of treatment (Time 1) were used as covariates to control for individual differences.

Preliminary investigations were conducted to ensure that none of the assumptions of normality, linearity, homogeneity of variances, homogeneity of regression slopes and reliable measurement of the covariate was violated. The results of the investigations showed that none of the assumptions was violated.

Table 7 shows that after making adjustments for pre-intervention scores, there was no significant interaction effect. $F(1,74)=0.54$, $p<0.59$, with a small effect size (partial eta squared=0.014). Both of the main effects were statistically not significant, teaching model: $F(2,74)=1.06$, $p=0.35$; computer self-efficacy: $F(1,74)=1.6$, $p=0.21$. The result showed no interaction effect between the groups and computer self-efficacy as the significance value shown in the table is 0.59, which is above the 0.05 cut-off value. However, the mean plot displayed in Figure 2 shows there was interaction effect between treatment and computer self-efficacy. These results tend to suggest that both the low computer self-efficacy and the high computer self-efficacy

Table 7
Test of Between Subject Effects on Graphic Design Theory 2 for Low and High Computer Self-Efficacy Groups

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	504.858[a]	6	84.143	9.563	0.000	0.437
Intercept	657.674	1	657.674	74.742	0.000	0.502
GDAT1	462.947	1	462.947	52.612	0.000	0.416
CSE2	14.103	1	14.103	1.603	0.209	0.021
Group	18.622	2	9.311	1.058	0.352	0.028
CSE2 * Group	9.446	2	4.723	0.537	0.587	0.014
Error	651.142	74	8.799			
Total	33197.000	81				
Corrected Total	1156.000	80				

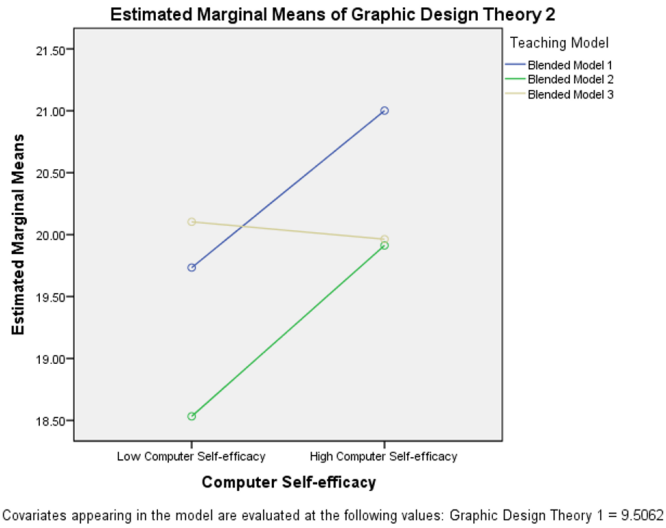

Figure 2. Means plot of estimated marginal means for graphics design theory 2.

groups in Blended Model 1 and 2 responded well to the two interventions with regards to graphic design theory. However, the high computer self-efficacy group in Blended Model 3 did not seem to benefit as much from the instruction. In general, there was no significant difference between the high computer self-efficacy group and the low computer self-efficacy group in all the interventions.

This is confirmed by taking a look at the adjusted means table on the dependent variable under investigation for the two groups. Table 8 shows that there was no remarkable difference in the mean scores of the low computer self-efficacy

group (M=19.44) and the high computer self-efficacy group (M=20.35). Based on the findings as a result of this test, the researchers rejected the alternative hypothesis and concluded that there was no significant difference between the low computer self-efficacy groups and the high computer self-efficacy groups in the three intervention groups on post-intervention scores on the graphic design achievement test.

In the same vein, the mean score of the low computer self-efficacy group in practical design was computed and compared with that of the high computer self-efficacy group. Data presented in Table 9 showed that there was a difference in practical graphic design means score between the two groups with the perceived high computer self-efficacy group having a higher mean score of 35.3750 compared to the perceived low computer self-efficacy group, which had a mean score of 29.8537.

Testing Hypothesis 3 (Ha_3)

There is significant difference in practical graphic design achievement means scores between high and low computer self-efficacy groups in the three intervention groups of pre-service art teachers taught using the ICT integrated studio teaching model.

The test involved was a 2-by-3 between-groups analysis of covariance. The independent variables were the type of teaching model (Blended Model 1, Blended Model 2 and Blended Model 3) and computer self-efficacy existing at high and low levels. The dependent variable was scores on graphic design practical (GDAR 2) administered following the completion of the treatment (Time 2). Scores on graphic design practical achievement (GDAR 1) obtained prior to the commencement of

Table 8
Estimated Marginal Means Table for Graphic Design Theory 2 (GDAT post-test) for the Two Computer Self-Efficacy Groups

			95% Confidence Interval	
Computer Self-Efficacy	Mean	Std. Error	Lower Bound	Upper Bound
Low Computer Self-Efficacy	19.457[a]	0.464	18.533	20.380
High Computer Self-Efficacy	20.293[a]	0.470	19.355	21.230

Table 9
Means Scores of Perceived Low and High Computer Self-Efficacy Groups for Graphic Design Practical 2 (GDAR post-test)

Computer Self-Efficacy	Mean	N	Std. Deviation
Low Computer Self-Efficacy Group	29.8537	41	3.75873
High Computer Self-Efficacy Group	35.3750	40	5.08233
Total	32.5802	81	5.23179

treatment (Time 1) were used as covariate to control for individual differences. Preliminary investigations were conducted to ensure that none of the assumptions of normality, linearity, homogeneity of variances, homogeneity of regression slopes and reliable measurement of the covariate was violated. In the same vein, Levene's test of equality of error of variances was checked, as shown in Table 10. The value of the test was 0.626, well over 0.05, a clear indication that the assumption was not violated.

Table 10
Levene's Test of Equality of Error Variances for Graphic Design Practical 2 (GDAR post-test)

F	df1	df2	Sig.
0.700	5	75	0.626

The result of the tests of between-subjects effects conducted is as shown in the main ANCOVA Table 11. After making adjustments for differences in pre-intervention scores, there was no significant interaction effect noticed. $F(2,74)=2.15$, $p<0.12$, with a moderate effect size (partial eta squared=0.06). Both of the main effects were statistically significant, teaching model: $F(2,74)=69.65$, $p<0.000$; computer self-efficacy: $F(1,74)=96.4$, $p<0.000$. There was no significant interaction effect between the groups and computer self-efficacy as the significance value shown in the table is 0.12. which is above the 0.05 cut-off value. The mean plot in Figure 3 also shows this absence of interaction clearly.

These results tend to suggest that both the low computer self-efficacy and the high computer self-efficacy groups responded similarly to Blended Model 1 and 2 but differently in Blended Model 3 with regards to the graphic design practical. However, the high computer self-efficacy group seemed to have benefitted more than the low computer self-efficacy group in all the interventions. This was confirmed by taking a look at the adjusted means Table 12 on the dependent variable under investigation for the two groups.

Table 11
Test of Between Subject Effects on Graphic Design Practical 2 (GDAR post-test) for Low and High Computer Self-Efficacy Groups

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1770.850[a]	6	295.142	52.140	0.000	0.809
Intercept	354.211	1	354.211	62.576	0.000	0.458
GDP1	96.627	1	96.627	17.070	0.000	0.187
CSE2	545.647	1	545.647	96.395	0.000	0.566
Group	788.519	2	394.259	69.651	0.000	0.653
CSE2 * Group	24.309	2	12.155	2.147	0.124	0.055
Error	418.878	74	5.661			
Total	88169.000	81				
Corrected Total	2189.728	80				

Table 12 shows that there was remarkable difference in the mean scores of the low computer self-efficacy group (M=29.898) and the high computer self-efficacy group (M=35.10). Based on the results presented above, the researchers failed to reject the alternative hypothesis of a significant difference between the low and high computer self-efficacy groups and concluded that the high computer self-efficacy groups in the three intervention groups performed better than the low computer self-efficacy groups in the graphic design practical.

DISCUSSION

The findings of this study are discussed according to the research questions and research hypotheses. It is also interesting to note the result of the effect of perceived computer self-efficacy on the overall graphic design mean scores of the pre-service teachers. Pre-service art teachers who perceived themselves high in computer self-

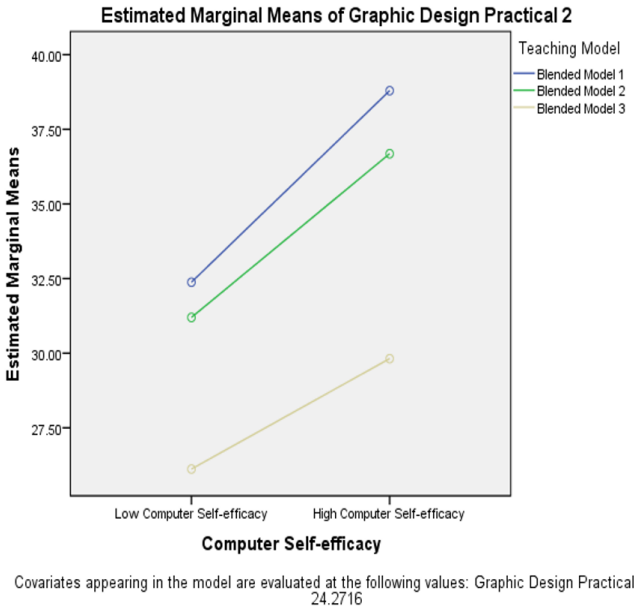

Figure 3. Means plot of estimated marginal means for graphics design practical 2 (GDAR2 post-test).

Table 12
Estimated Marginal Means Scores of Perceived Low and High Computer Self-Efficacy Groups for Graphic Design Practical 2 (GDAR post-test)

			95% Confidence Interval	
Computer Self-efficacy	Mean	Std. Error	Lower Bound	Upper Bound
Low Computer Self-Efficacy	29.898[a]	0.372	29.157	30.639
High Computer Self-Efficacy	35.098[a]	0.377	34.346	35.850

efficacy were found to perform significantly higher than those who perceived themselves low in computer self-efficacy. This result lays credence to consistent empirical research findings that have persistently pointed to the fact that academic achievement of students is enhanced by their self-efficacy beliefs (Bandura, 1997; Tamara & Koufteros, 2002; Ismail et al., 2005). This can be probably explained by Bates and Khasawneh's (2007) finding that students with higher computer self-efficacy beliefs tended to spend more time using online learning technology and were, therefore, better engaged in the learning processes than their counterparts with low computer self-efficacy beliefs. There is a relationship between perceived self-efficacy with respect to academic subjects and achievements. According to Multon et al., (1991) evidence shows that self-efficacy appraisals make a positive contribution to academic achievements.

No significant difference was found to exist between perceived high computer self-efficacy groups and the perceived low computer self-efficacy groups in graphic design theory post-test mean scores. This finding may seem obvious in view of the fact that one does not require to have high computer self-efficacy beliefs to be able to perform in an achievement test that in itself is not computer-based. In dealing with theory-based learning, both those with high and low computer self-efficacy beliefs had a wide range of resources to turn to in order to perform well in the test. This can be explained in part that any student with average intelligence should be able to do well in a theory test if the topic has been presented in class or the teacher referred them to some resources for that purpose irrespective of computer self-efficacy belief levels.

On the other hand, differences existed between the perceived high and perceived low computer low computer self-efficacy groups in the three intervention groups that took part in the study with regards to their mean scores in the graphic design achievement (practical). This presupposes that the IISTM can successfully help increase graphic design achievement scores of students, especially Models 1 and 2. The findings are more favourably disposed to learners with high computer self-efficacy. As the graphic design practical involved the designing of visual communication materials using computers and related software, the importance of the pre-service teachers' computer self-efficacy beliefs was at its greatest. Pre-service teachers with high efficacy beliefs will definitely persevere and engage in the design task until a reasonable degree of success is achieved compared to their low computer self-efficacy colleagues whose level of engagement in the design task are likely very shallow (Bates & Khasawneh, 2007). In a controlled learning environment where design process was monitored by the teacher educator to avoid any form of malpractice, the true performance of the participants was thus reflected.

CONCLUSION

The teaching of graphics design including computer graphics in tertiary institutions in Nigeria has been dominated by theory rather than the practical use of computers and computer software packages as recommended in the NCCE minimum standards for NCE teachers. The findings of this study revealed that high computer self-efficacy beliefs of the pre-service teachers had a positive effect on their graphic design practical achievement. However, the study has shown that computer self-efficacy beliefs of pre-service art teachers have no significant effect on their graphic design theory achievements. On the other hand, its effect on their overall graphic design achievement is very significant.

RECOMMENDATIONS

The researchers recommend that art teacher educators in colleges of education should improve their computer graphics skills as well as endeavour to model the use of computer technology in teaching the course to pre-service teachers. This practice will motivate pre-service teachers, thereby boosting their computer self-efficacy beliefs. Watching an individual perform such a task using the computer has been reported to stimulate and motivate learners into believing that they are capable of doing so and even doing better than the person demonstrating the task. This makes them persevere in the design task no matter the difficulty level. Cognisant of the importance of motivation in the achievement of learners, teacher educators should therefore endeavour to promote high self-efficacy belief among learners. They should be mindful of individual differences in learning style and as such, adopt teaching strategies that are capable of benefitting both the high and low computer self-efficacy group of learners.

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