COMPUTER ANXIETY AMONG SCIENCE AND TECHNOLOGY TEACHERS

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Abstract

Computer technology has the capacity to affect the efficiency and productivity of teachers. This paper investigated computer anxiety among science and technology teachers in Minna and Ilorin metropolis, Niger and Kwara States, respectively. The purpose of this study was to determine the anxiety level of science and technology educators and their attitude toward participation in computer-based training and the use of computers in the classroom. Two research questions were formulated and two null hypotheses were tested at 0.05 level of significance. The design of the study was a survey research design. The sample of the study consisted of 456 science and technology teachers drawn from secondary school teachers in the two metropolis. The instruments used for data collection were Learning Style Inventory, Computer Anxiety Scale (COMPAS) and a closed form of the participant inventory constructed by the researchers. Data were analyzed using frequency count, percentage, mean and analysis of variance (ANOVA). Results revealed that majority of the educators had positive attitude toward participation in computer-based training and the use of computers in the classroom. However, there were some differences between their opinions about computer-based training and computer implementation in classrooms. Less than one-quarter of the teachers were experiencing some level of computer anxiety. There was significant difference between computer anxiety and highest educational qualification. Recommendations made among others were that science and technology education administrators should provide educators with more opportunities to get hands-on experience with computers.

Key words: Computer anxiety, computer technology and computer-based training.

Introduction

Computer Technology is increasingly growing its importance in the education sector. The more computer technology advances, the more benefits it provides for teachers and students at every education level. Today, computer technology has been incorporated into a good number of curriculum even those that do not belong to the computer classes. Teachers and students make use of computers for presentations and also make use of the Internet to carry out research on a variety of topics for their essays, papers and also for teaching and learning. Computers facilitate audio-visual representation of information; thus, making the process of learning interactive and interesting. Computer-aided teaching adds a fun element to education. Teachers hardly use chalk and board today. They bring presentations on a flash drive, plug it into a computer in the classroom, and the teaching begins. There's colour, there's sound, there's movement - the same old information comes forth in a different way and learning becomes fun. The otherwise not-so-interesting lessons become interesting due to audio-visual effects. Due to the visual aid, difficult subjects can be explained in better ways.

Since computer technology has the capacity to affect the efficiency and productivity of education and to capture computer-related improvements in efficiency and productivity, educators must learn, through pre-service and in-service training activities, what the computer is and what it can do (Yang, Mohamed, & Beyerbach, 1999). Computer anxiety and lack of competencies among educators has been impeding the effective integrationof computers into education programs (Bingimlas, 2009;Gunter, Gunter, & Wiens, 1998; Reznich, 1996; Yang, 1996). Computer anxiety according to Simsek (2011), may be a serious barrier against learning how to use computers effectively.

Maurer cited in Simsek (2011), defined computer anxiety as the fear and apprehension felt by an individual when considering the utilization of computer technology or when actually using it. Chua, Chen, and Wong (1999), also defined computer anxiety as a fear of computers when using one or fearing the possibility of using it when needed. These definitions showed that computer anxiety is characterized as an affective response. It is different from negative attitudes toward computers that entail personal beliefs and feelings about computers rather

than one's emotional reaction towards using computers (Sam, Othman, & Nordin, 2005).

Computer anxiety has been conceptualized as a multi-dimensional construct. According to Torkzadeh and Angulo (1992), there are three major dimensions of computer anxiety as psychological, operational, and sociological. To be more concrete, psycghological dimension includes attitudes toward computers, self-efficacy, personality types, avoidance, and self-perceptions. Operational dimension usually results from computer courses, teachers, nature of computers, the extent of experiences with the computer, and owning a personal computer. There is a sociological dimension related to factors of age, gender, nationality, socio-economic status, and the field of study.

Beckers and Schmidt (2001), suggested a six-factor computer anxiety model. The dimensions of this model are: (a) computer literacy of basic computer skills, (b) self-efficacy on learning how to use computers, (c) physical awareness while using computers such as breathing or sweating, (d) attitudes toward computers, (e) positive belief regarding the benefits of computers to society, and (f) negative beliefs on effects of computers.

Most of the research findings are mixed regarding the role of these factors on computer anxiety. However, research tends to support the idea that more experiences with computers reduce the level of anxiety. This is particularly true when students start using computers at early ages, own a personal computer at home, use computers more frequently in daily life, and their academic major is a technical one (Chou, 2003; Gordon, Killey, Shevlin, McIlroy, & Tierney, 2003).

Studies have examined the relationship of computer anxiety to various demographic variables, such as, gender, age, and academic major or teaching field. There are also a number of studies on the relationship of computer experience with computer anxiety (Marcoulides, 1988; Banksand Ackerman, 1990;Meng-jung, 2003; Anderson, 1996; Ayersman, 1996; Cooper & Stone, 1996; Harris & Grandgenett, 1996; McInerney, McInerney, & March, 1997). Although, there were situations where a significant body of research exists, the results of most studies are inconsistent (Maurer, 1994).

Studies that focus only on the relationship between demographic variables and computer anxiety may be misleading because demographic variables and computer anxiety both have a relationship with computer-

related experience. The direct relationship between computer-related experience and computer anxiety seems clear (McInerney & McInerney, 1994; Dyckand Smither, 1994;Chen, 1986; Hadfield, Maddux, & Love, 1997; Banks & Ackerman, 1990). Several studies have suggested that prior computer-related experience also should be taken into account as a covariate when examining the relationship between computer anxiety and demographic variables (Chen, 1986; Maurer, 1994; McInerney, McInerney & Sinclair, 1994; Yang, 1996). Both the demographic characteristics and computer-related experience of vocational-technical educators vary.

Purpose of the Study

This paper investigated computer anxiety among science and technology teachers in Minna and Ilorin metropolis in Niger and Kwara States respectively.

Specifically, the study sought to investigate

1. How computer-related experience affects the relationship of computer anxiety in science and technology teachers to selected personality and demographic variables: learning style, age, gender and educational qualification.
2. The anxiety level of science and technology teachers and
3. The attitude of science and technology teachers toward participation in computer-based training and the use of computers in the classroom

Research Questions

Based on the purposes of this study, the following question guided the investigation:

1. To what extent does computer anxiety in science and technology teachers relate to personality and demographic variables?
2. What is the anxiety level of science and technology teachers? and
3. What is the attitude of science and technology teachers toward participation in computer-based training and the use of computers in the classroom?

Research Hypothesis

Ho: There are no significance relationship among computer anxiety and learning style, age, gender and educational qualification

Methodology

The design of the study was a survey research design. The sample of the study consisted of 912 science and technology teachers drawn from

secondary school teachers in the two metropolis. A list of science and technology educators sorted by teaching/professional fields was obtained from the School Boards. Survey research was used to obtain specific information from a representative sample of these teachers about computer anxiety levels, learning styles, and selected personality and demographic variables. Simple random selection, using a table of random numbers, modified by stratification across teaching/professional fields was used to sample the population. The final population consisted of all science and technology teachers in the two Metropolis who were teaching in Secondary schools. A stratified random sample of 456 teachers (50%) was selected from the total population of 912 teachers.

The instruments used for data collection were Learning Style Inventory (LSI)(Kolb, 1985), Computer Anxiety Scale (COMPAS) (Oetting, 1983), and a closed form of the participant inventory constructed by the researchers. The 1985 version of Kolb's LSI was selected for use in this study. The LSI which consisted of 12 simple sentence completion items, and require the respondent to rank order 4 sentence endings that correspond to the 4 learning modes: concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE) was used to classify an individual into one of four learning style types: converger, diverger, assimilator, or accommodator. The highest number of choices relevant to a learning mode yields a raw score varying from 12 to 48. This score was used to classify an individual into one of four learning style types: converger, diverger, assimilator, or accommodator. The LSI also yields two combination scores that indicate the extent to which the individual emphasizes abstractness over concreteness (AC-CE) and action over reflection (AE-RO). The combination raw scores vary from +36 to -36. The entire LSI comes in a self-scoring booklet containing the inventory, the Learning Style profile, and the Learning Style type grid. The reliability data of the LSI for the four basic scores and two combination scores indicate good internal consistency as measured by Cronbach's Standardized Scale alpha (n=268). The combination scores indicate almost perfect additivity (1.0) as measured by Tukey's Additivity Test (Kolb, 1984).

The short form of Oetting's COMPAS was used for this study. The reasons for choosing the COMPAS were as follows: (a) The objective of the investigation was to measure

computer anxiety; (b) The testing time was limited; and (c) The COMPAS is reportedly valid for measuring vocational-technical teachers' computer anxiety levels (Gordon, 1993).The short form of the COMPAS consists of Likert-type items for which respondents report their subjective feelings of anxiety. The overall computer anxiety scale range is 10 to 50. The subscale ranges and their respective classifications are 10-19 (very relaxed/confident), 20-26 (generally relaxed/comfortable), 27-32 (some mild anxiety present), 33-36 (anxious/tense), and 37-50 (very anxious).

The COMPAS has been reviewed by psychologists Kleinmuntz (1985) and Wise (1985). Even though Kleinmuntz questioned the importance of measuring computer anxiety, both reviews indicated that if one wishes to measure computer anxiety, the COMPAS is the test to use. Using Cronbach's alpha, Oetting (1983) calculated the overall internal consistency reliability for the short form as r = .88. According to Oetting, the total score on the short form correlates very highly (r = .96) with the total score on the long form, but no subscale scores can be obtained. The participant inventory form was designed to collect demographic and background data about the participants. It consists of questions related to age, gender, educational qualification, the number of computer-related courses or training workshops completed, self-ranked computer skills, and self-perception toward computer usage.

All 456 educators were sent the survey, along with a letter of explanation of this study. In order to preserve anonymity, the survey package was not marked or numbered in any way. The return rate was 84%. Of the returned packages, 80.8% provided usable data. Data were considered unusable if one or more of the forms (LSI, COMPAS, and the participant inventory) were incomplete or completed incorrectly.

Results

Table 1: Demographic and Personality Characteristics of the Respondents

Variables		Frequency	Percentage
Age	Under 30 years	55	14.21
	31-40 years	104	26.88
	41-50 years	120	31.00
	51 years and Above	108	27.91

Gender	Male	221	57.11
	Female	166	42.89
Highest Qualification Level	PhD	09	2.33
	M.Ed/M.Tech/M.Sc	83	21.44
	BSc/Bed/B.Tech	184	47.55
	NCE	111	28.68
Learning Style	Accomodator	65	16.80
	Diverger	53	13.70
	Converger	181	46.76
	Assimilator	88	22.74

Table 1 revealed that Fewer than 4 in 10 of the science and technology teachers were younger than 40 years old (41.09%). The majority were over 40 (58.91%). The majority of the teachers were men (57.11%), while only (42.89%) were women. Most (71.32%) had at least first degree as qualification while (28.68%) had Nigerian Certificate in Education. Over 69.50% of the teachers tended to be convergers and assimilators, that is, they preferred to learn by thinking; they analyzed ideas logically, and they planned systematically. Their actions resulted from an intellectual understanding of situations. In contrast, only about 30.50% of the responders preferred to learn from feeling, they tended to be accommodators and divergers. They learned from specific experiences, they related to people, and they were sensitive to people's feelings. Additionally, a majority (61%) preferred to learn by doing, they intended to be convergers and accommodators. They had the ability to get things done, they were risk-takers, and they influenced people and events through action. The rest preferred to learn by watching and listening; they intended to be divergers and assimilators. They carefully observed before making judgements, viewed issues from different perspectives, and looked for meaning in situations. Learning styles were classified as accommodator (16.80%), diverger (13.70%), converger (46.74%), and assimilator (22.74%).

Table 2: Perception of Respondents on Computer Usage

Perception	variable	N	Percentage
Rating Scale: the need for computer-based training	low	28	7.30
	moderate	139	35.75
	High	220	56.95
Computer technology applied in the classroom	low	96	24.69
	moderate	114	29.46
	High	177	45.85

Table 2 revealed that most of the educators were involved in computer-based training. 75.31% of the respondents indicated they participated at least once in a computer-related training programme or class. However, only 45.85% of the respondents indicated that they had a high level of computer skill and knowledge; 24.69% percent indicated they had little or no skill or knowledge.

Table 3: COMPAS Scores of Respondents for Overall Computer Anxiety

Computer Anxiety Levels	Range	Frequency	Percentage
Very anxious	37-50	42	10.87
Anxious/tense	33-36	35	9.05
Some mild anxiety present	27-36	89	23.06
Generally relaxed/comfortable	20-26	118	30.54
Very relaxed/confident	10-19	102	26.48

Table 3 presents the descriptive data on the anxiety level scores of science and technology teachers as measured by the COMPAS. The scores ranged from a maximum of 50 to a minimum of 10. The table reveals that 10.87% of the respondents were very anxious, 9.05% were anxious or tense, 23.06% were experiencing some mild anxiety, 30.54% were relaxed or comfortable and only 26.48% of the respondents were very relaxed or confident.

Table 4: One way Analysis of Variance (ANOVA) on Demographic Variables and Computer Anxiety

Variable		Mean	SD	N	P	F
Learning Styles	Accomodator	20.34	6.06	65	.95	0.24
	Diverger	22.45	7.32	53		
	Converger	21.31	8.53	181		

	Assimilator	19.69	8.77	88		
Age	Under 30 years	21.06	9.06	55	.34	1.69
	31-40 years	20.45	8.33	104		
	41-50 years	18.74	7.15	120		
	51 years and Above	22.01	9.11	108		
Highest Qualification Level	PhD	19.73	8.65	09	.08	4.89*
	M.Ed/M.Tech/M.Sc	20.89	7.90	83		
	BSc/Bed/B.Tech	21.74	8.72	184		
	NCE	22.07	9.10	111		
Gender	Male	22.03	8.54	221	.09	1.89
	Female	21.65	8.72	166		

P < .05

In table 4 One-way analyses of variance (ANOVA) indicated that there were no significant differences for computer anxiety among learning style (p=.95), age (p=.34) and gender (p=.08). There were significant differences (p< .05) for computer anxiety among educational qualifications (p=.01).

Discussion of Findings

The results in table 1 revealed the profile of science and technology teachers with respect to their age, gender, highest qualification and learning style. The age of science and technology teachers is between 30 years and above and majority are male. This finding indicates there are more male science and technology teachers. Generally, male were consistently found to outnumber the females in the field of science and technology. This affirms Dyankor (1996), views that in many countries in conformity with certain traditions, science and technology education is regarded predominantly for boys only and attempt are being made to encourage girls to develop interest in science and technology education. The majority of the teachers possessed Bachelors degree and NCE as highest qualification. Only few of the teachers had Masters degree and PhD. This in line with the policy of Federal Government of Nigeria that Stipulated NCE certificate as minimum qualification for Junior secondary school teachers (UBE). The profile further revealed that over 69.50% of the educators tended to be convergers and assimilators, that is, they preferred to learn by thinking, they analyzed ideas logically, and they planned systematically. Their actions resulted

from an intellectual understanding of situations. In contrast, only about 30.50% of the respondents preferred to learn from feeling, they tended to be accommodators and divergers. They learned from specific experiences, they related to people, and they were sensitive to people's feelings. Additionally, a majority (61%) preferred to learn by doing, they intended to be convergers and accommodators. They had the ability to get things done, they were risk-takers, and they influenced people and events through action. The rest preferred to learn by watching and listening; they intended to be divergers and assimilators. They carefully observed before making judgements, viewed issues from different perspectives, and looked for meaning in situations (Yang, Mohamed and Beyerbach, 1999; Yang, 1996).

The result shows that a majority of the responding science and technology teachers had a positive attitude toward participation in computer-based training and the use of computers in the classroom. However, there were some differences between their opinions about computer-based training and computer implementation in classrooms. None of the respondents believed that computer-based training was unnecessary for science and technology teachers. Most of respondents (35.75% and 56.95%) thought there was a need to train science and technology teachers in the use of computer technology in the classroom or laboratory. However, fewer respondents (45.85%) rated highly the extent to which computer technology was an essential component of their classroom and lastly, 7.30% of the respondents indicated that applying computer technology to their classroom was not important at all. This is in line with the opinion of Odunjo (2015), that pointed out thatcomputer literacy is key to the survival of modern day science and technology teachers.This finding may be explained by the fact that respondents were in a variety of professional/teaching fields. Some respondents indicated that computer-based training for computer knowledge and skills was essential; however, computer technology did not necessarily play a critical role in their professional domain.

The finding revealed that majority of the science and technology teachers were either relaxed/comfortable or very relaxed/confident while only few of the teachers were experiencing some mild anxiety or were anxious about computer. This findings is in agreement of Yang, Mohamed and

Beyerbach (1999), who investigated computer anxiety among vocational-technical teachers in Dade County, Florida and discovered that there are levels of anxiety among vocational-teachers. The anxiety was as a result of the fact that computer literacy among teacher is being emphasized by Nigerian Government and as such all teachers that want relevance in the computer age must know how to use computer.The results of this study indicated there were no relationships between computer anxiety in science and technology teachers and these demographic variables: age, gender and learning style. However, there was significant difference for computer anxiety among educational qualifications.

Conclusion

The aim of this paper was to provide information on encouraging the desired improvement on teaching situation to those responsible for the integration of ICT into science education. The findings of this study indicate that teachers have a strong desire for the integration of ICT into education but that they encountered many barriers. The major barriers were lack of confidence, lack of competence, and lack of access to resources. Since confidence is a kinto good teaching, the presence of all components increases the likelihood of excellent integration of ICT in learning and teaching opportunities.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. Reduce computer anxiety by increasing computer-based training. Science and technology education administrators should provide educators with more opportunities to get hand-on experience with computers. Administrators should encourage teachers to spend more time in computer-based training and provide educators easy access to computers. More exposure could help reduce computer anxiety among vocational-technical educators.
2. Reduce computer anxiety by enhancing computer competence. Easier and more efficient software should be adopted in science and technology education. Computer-based training programmes should focus on concrete computer skills, rather than teaching abstract concepts and jargon. Initial training should introduce educators to application or productivity software (word

processing, graphics, page layout or desktop publishing, slide show or presentation, database, spreadsheet and charting, hypermedia, and telecommunication programs), rather than to computer programming (BASIC, Pascal, C, C++, etc.).

3. Reduce computer anxiety by increasing computer confidence. Computer-based training programs should be planned and developed to prevent the escalation of initial anxiety (Yang, 1996). This could be accomplished by focusing on building confidence and a sense of personal control in an individualized, non-threatening learning environment and also by eliciting the efforts of family, trainers, peers, and colleagues to help dispel stereotypes.
4. Reduce computer anxiety by improving computer perception. Computer-based training programs should be relevant to educators' interests and learning style. The training programs should provide hands-on learning, opportunities for feedback, supportive and caring instruction, and active learning experiences in which educators work on their own projects and see the application of computer skills to their area of study (Comer & Geissler, 1998).

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