Differences in Anxiety Between IT Competent And Incompetent Malaysian Pre-Service Teachers: Can a Discrete IT Course Taught in a Constructivist Learning Environment Solve This Problem?

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Abstract: The purpose of the study was to determine if teaching a discrete course in a constructivist learning environment could reduce the level of anxiety towards Information Technology (IT) among pre-service teachers who perceived themselves as IT competent (Group 1) and IT incompetent (Group 2). The study also sought to investigate if the anxiety level gap between Group 1 and Group 2 could be reduced through this method of teaching. Participants who were from Group 2 showed significantly positive changes in terms of their anxiety level after completing the course. Pretest results showed that participants who were IT competent had significantly lower level of anxiety towards IT. While the posttest results showed no differences between Groups 1 and 2 by the end of the course. The results indicated that participants who perceived as IT incompetent benefited more from the course compared to those who perceived themselves as IT competent. The results also suggested that infusing constructivism into a discrete IT course can reduce the anxiety level among participants who perceived themselves as IT incompetent.

Introduction

As Information Technology (IT) is becoming more prevalent in today's education system, the pressures on the teachers' role are becoming more complex and diverse and initial teacher training institutions are expected to develop more IT competences in their students. In the quest of acquiring such competencies, the term computerphobia has become synonymous with acquiring IT knowledge and skills. Rosen and Weil (1992) defined this term as

> "anxiety about present or future interactions with computers or computer related technology; negative global attitudes about computers, their operation or their societal impact; and/or specific negative cognitions or self-critical internal dialogues during actual computer interaction or when contemplating future computer interaction" (pp. 7-8).

King, Bond and Blandford (2002) echoed the views of Bowers and Bowers (1996), Brosnan (1998), Gos (1996) and Presno (1998) and summed up that there is a pressing need to master at least an elementary level of IT skills to reduce students' anxiety levels. Contrarily, Gos (1996) argued that prior computer experience does not reduce the anxiety level of the user. Instead, the quality of the experience plays a significant role in reducing the anxiety level. This means that how pleasant or unpleasant the experience makes a difference. He suggested that teachers and instructors play a crucial role in making the students' early computer experience as pleasant as possible. While Hakkinen (1994/1995) stressed that one way of increasing users' computer experience is through encouraging them to work on their own with computers at the initial stages. What matters is the pleasant experience in their first encounter with computers. Hakkinen (1994/1995) warned that an unpleasant experience can create negative attitudes which hamper learning and strongly suggested that making the atmosphere of the learning situation positive and relaxed would be beneficial for learning. Gunter (2001) stated that many institutions of higher learning have failed in providing a positive experience to those while learning essential technology skills.

Clearly, the literature discussed has shown that the quality of experience plays a crucial role in the level of anxiety towards technology. In order to enhance the quality of experience, a pleasant and appropriate learning environment must be created for the learners to experience. It is, therefore, the goal of this study to determine if anxiety level can be reduced among IT users through a constructivist learning environment. In this study, the researchers seek to study the level of anxiety towards IT instead of computers per se since the study covers more than just computers. According to Wong (2002), anxiety toward IT is defined as the users' feelings of uneasiness and apprehension in using the Internet, specific software applications, software applications in general, computer and IT for leisure or work.

Constructivist learning environment

According to Fosnot (1996), constructivism originated from the field of cognitive science, particularly from the work of Jean Piaget, the sociohistorical work of Lev Vygotsky and Jerome Bruner. A constructivist learning environment places emphasis on the construction of knowledge based on the learner's past experience. Wilson (1996) succinctly defined it as a ''place where learners may work together and support each other as they use a variety of tools and information resources in their guided pursuit of learning goals and problem solving activities'' (p.5). The environment engages the learners in the learning process rather than on providing instruction. Students, therefore, become active participants in the learning process and set their own learning goals. In such learning environment, they learn how to assimilate and accommodate new information acquired and to build new knowledge based on existing knowledge.

In such learning environment, technology has been proven to enhance the teaching-learning process. Whitworth and Berson (2003) asserted that technology based learning can help the development of students' decision making and problem solving skills, data processing skills and communication capabilities. Suffice to say, the students' roles shift from being passive learners to active learners. Robin and Harris (1998) stressed that IT can be used as a tool to assist in such environment with its ability to access, store, manipulate and analyze information. Students will, instead, spend less time to gather information but more time in reflecting the objectives that they have set (Robin and Harris, 1998). Coombs and Wong (2000) further added that access to the Internet can enhance the learning tasks as it opens up the sea of opportunities to obtain authentic resources in the form of graphic and video materials. The Internet also promotes active learning among students as up to date information is available at their finger tips. The ease of accessing the Internet at cyber cafes or at laboratories in learning institution has made it possible for students to seek and gain knowledge at their own pace. Information gained from this medium must then be reorganized, expanded and collapsed throughout the learning process (Chen, Hsu and Hung, 2000).

Whilst, the instructor acts as a guide and their role ceases from being the main player in the classroom to being the facilitator. Poole (2000) stressed that "the student is the center of learning; the teacher is a facilitator who creates meaningful situations for students to explore" (p.13). One meaningful situation is to provide students with authentic learning experience which they can relate to; and to explore and discover new knowledge and skills. In such a learning environment, students gain direct access to the knowledge-base and work independently (individually or small groups) to solve real life problems (Hirumi, 2002).

Objectives of the study

This study sought to determine if teaching a discrete IT course in a constructivist learning environment could help reduce the level of anxiety towards IT among pre-service teachers at Universiti Putra Malaysia (UPM) who perceived themselves as IT competent (Group 1) and incompetent (Group 2). The study also sought to investigate if the gap between IT competent and incompetent participants in terms of their anxiety level could be reduced when exposed in such learning environment.

Course description

The course, Information Technology in Education (EDU 3033) is a compulsory course for all students majoring in education at the Faculty of Educational Studies, UPM. This course seeks to impart rudimentary knowledge and skills in IT to potential teachers so that they are able to use IT in their professional work and teaching. They are taught basic productivity tools such as word processing, spreadsheet, database and presentation. The software that is being used is the Microsoft Office 2000 package. They are also taught how to surf the Internet and use the electronic mail as well as to create their personal homepage. The course runs for 14 weeks throughout the semester.

Instructional context

EDU 3033 comprises a 2 hour lecture and a 3 hour practical session. The lecture is conducted in a lecture hall where all students will be taught the rudiments of each productivity tool, the Internet, home page creation and e-mail. The lecture hall is equipped with a projection system which allows the course instructor to project the contents of the laptop screen. The students are randomly assigned into groups at the beginning of the semester and the number of students range from 20 to 30 students depending on the size of the laboratory. Each student is given access to a personal computer with Internet connection in the laboratory. The instructor handles the lecture as well as the practical sessions.

During the practical sessions, students are given authentic hands-on exercises and assignments. For example, in the lesson for presentation (Microsoft Powerpoint), the instructor shows basic skills in creating new slides, using templates, changing background, inserting graphics and others in the lecture hall. The assignments given for the practical sessions require students to prepare slide presentations related to their subject matter. They would need to select a chapter in the school curriculum and prepare the contents of the presentation to be used as a teaching aid. A student who majors in Agriculture for example, would be required to download graphics and pictures related to plants from the Internet. In such a learning environment, the student needs to retrieve what they have learnt to produce a slide presentation requiring uniqueness and creativity from the student.

The course instructor gives instructions in hardcopy form and then explains verbally of what is expected from the students. This usually takes 10 minutes of the laboratory hours while the students do the exercises for the rest of the time. The instructor's role is to assist and guide the students in their work. Throughout the practical sessions, the students are strongly encouraged to discuss with peers and form their own groups. Nevertheless, the exercises given are as an individual work. The students are encouraged also to register for a free e-mail account on their own and to explore the class bulletin board.

Methodology

Samples

The samples comprised 85 students from an experimentally accessible population of 110 students enrolled in EDU 3033. Sixty (70.6%) of these participants were females while the rest were males. The mean age of the participants was 20.99 (*S.D.*=0.46).

Instrumentation

The instrument used in this study was adapted from Wong (2002). The original version measured attitudes constructs comprising confidence, usefulness, anxiety and aversion. For the purpose of this study, only one construct was used where 11 items measuring anxiety were extracted from the original instrument. These items were content validated by 2 content experts and subsequently was pilot tested on a group of students who were not part of the experimentally accessible population. They were students who had taken EDU 3033 a semester before the actual study was conducted. The Cronbach alpha was reported at .87. The participants of the pilot study were also asked to identify any items which were unclear to them. No ambiguous item was reported at this stage.

Two sets of questionnaires were developed in the national language for the actual study. Both sets were identical. Both sets comprised six items to assess the participants' perception of their skills in terms of 1). Word processing, 2). Spreadsheet use, 3). Database management, 4). Presentation software use, 5). Web browsing, and 6). Telecommunications use. The items were measured in a 5 point Likert scale ranging from 'very skilful' to 'not skilful at all'. There were another 11 items measuring anxiety.

Data collection

Data collection was carried out over three semesters when the primary author of this paper was the instructor for EDU 3033. Data were collected at the beginning of the course (Time 1) and once again at the end of the course (Time 2).

Limitations of the study

Generalizability of the finding beyond the present study is limited because participants from one university was sampled. More specifically, the study was carried out on participants who had taken EDU 3033 at the Faculty of Educational Studies, UPM. In addition, the results should also not be generalized to a population who has not taken the same course.

Results

The Cronbach's alphas of the pre-and posttests scores were recorded at .91 and .93. All the items recorded values greater than .30 for the corrected item-total correlation.

Table 1: Mean scores of pre- and posttest for anxiety

Variable	Pretest		Posttest	
	M	*S.D.*	*M*	*S.D.*
Anxiety*	41.87	7.03	42.61	8.63

* A high score represents low anxiety

An alpha level of .05 was used for all statistical tests. The pretest mean scores were lower than the mean scores of the posttest (see Table 1). The paired sample *t*-test on anxiety, however, yielded non significant pre- (M= 41.87; *S.D.*= 7.03) and post test differences (M= 42.61; *S.D.*= 8.63), *t*(84)= -.88, *p*= .379. The eta squared statistic (.01) indicated a small effect size. There seemed to be a trend toward lesser anxiety level at the end of the course. It could be concluded that the participants were equally anxious at the start and towards the end of the course.

The data was split so that a paired sample *t*-test could be conducted individually for those who are IT competent and those who are not. There was still no significant difference in the mean scores from Time 1 (M= 45.80, *S.D.*= 6.75) to Time 2 (M= 43.28, *S.D.*= 11.33), *t*(24)= 1.35, *p*= .188 for Group 1. The eta squared statistic (.10) indicated a moderate effect size. There was, however, a statistically significant difference from Time 1 (M=40.23, *S.D.*= 6.53) to Time 2 (M= 42.33, *S.D.*= 7.31), *t*(59)= -2.47, *p*= .017 for Group 2. The magnitude of the differences in the means was moderate (.09). Those who perceived themselves as IT competent do not seem to be as anxious as those who perceived themselves as incompetent.

Pretest

Higher mean scores were recorded for those who perceived themselves as IT competent (Group 1) as compared to those who perceived themselves as incompetent (Group 2) (see Table 2). There was a significant difference in mean scores for Group 1 (*M*= 45.80, *S.D.*= 6.75) and Group 2 (*M*= 40.23, *S.D.* 6.52), *t*(83)= -3.55, *p*= .001. The magnitude of the differences in the means was large (eta squared= .13). Participants who perceived themselves as IT competent had lower anxiety level than those who perceived themselves as non IT competent.

Table 2: Mean difference of levels of competency on pretest anxiety scores

Competency	Anxiety*	
	M	S.D.
Competent	45.80	6.75
Incompetent	40.23	6.52

* A high score represents low anxiety

Posttest

At the end of the course, participants in Group 1 still scored higher than those in Group 2 (see Table 3). There was no significant difference between Group 1 (*M*=43.28, *S.D.*= 11.33) and Group 2 (*M*=42.33, *S.D.*= 7.31), *t*(32.65)= -.39, *p*= .702. The magnitude of the differences in the means was very small (eta squared= .002). There were no significant differences between the two groups of participants in terms of anxiety.

Table 3: Mean difference of levels of competency on posttest anxiety scores

Competency	Anxiety*	
	M	*S.D.*
Competent	43.28	11.33
Incompetent	42.33	7.31

* A high score represents low anxiety

Discussion and implications

The paired samples t-test showed marginal increment in the level of anxiety before and after the participants had undergone the discrete IT course. The difference in the mean scores, however, was not significant. The result seemed to suggest that there was no effect on the level of anxiety after training. What seemed obvious is that the participants already had a low level of anxiety (M= 41.87; $S.D.$= 7.03) at the beginning of the course. Participants who enrolled in the course were not anxious at the initial stage. For that reason, it came as no surprise that participants' level of anxiety did not decrease even after they had been through 14 weeks of IT training.

When the data was analyzed separately according to the two groups, only participants who perceived themselves as incompetent seemed to have benefited from the training. Participants from Group 1 had low level of anxiety at the beginning of the course unlike those who were from Group 2. They could be categorized as those who have a moderate level of anxiety. After training, participants from Group 1 still remained in the low level of anxiety category, indicating that the training did not have any effect on their anxiety level. While there was a positive significant shift from having a moderate level of anxiety to having a low level of anxiety for those who were categorized as IT incompetent.

The pretest result also indicated that those who perceived themselves as IT competent had significantly lower level of anxiety as compared to those who perceived themselves as incompetent. Based on the mean scores, those in Group 1 could be categorized as those with low level of anxiety and those in Group 2 as those with moderate level of anxiety. Before the start of the course, there were two distinct groups with differing levels of anxiety. This finding concurred with Yildrim (2000) who found that teachers at the start of a training course could be categorized into different levels of competency (novice, intermediate and competent). Those from the three categories had significant differences in terms of their anxiety level.

The posttest results showed that the differences between competent and incompetent participants disappeared at the end of the IT course. It could be assumed that participants who perceived themselves as incompetent seemed more favourable towards IT. The level of anxiety gap between competent and incompetent participants was narrowed down. From the mean scores obtained, both Groups 1 and 2 participants could be placed in the same category; they now have low level of anxiety. The mean scores of competent participants for the posttest seems to decrease marginally as compared to the mean scores for pretest. However, on both occasions, the participants still remained in the same level of anxiety. They had low level of anxiety.

From simple observation by the instructor, the infusion of a constructivist learning environment into an IT discrete course has encouraged students to use current knowledge and skills they possessed to build on and to generate new knowledge and skills when they did their assignments. The authentic hands on experience given during the practical sessions seemed to lessen the anxiety level of incompetent participants as they showed uneasiness and apprehension at the beginning of the course. They, however, showed enthusiasm when they found out they could actually turn in quality assignments. Some expressed delight at just being able to complete the assignment even though they found it difficult. Students also learn to make decisions, for example, in the presentation assignment, they had to decide which topic in the school syllabus would make a good presentation.

The instructor also encouraged IT competent students to help those who had trouble with their assignments during the practical session. Later, the instructor noticed that the IT incompetent students started approaching peers who were able to complete the assignments or those who were ahead of them. Interactions and discussion was obvious through mid term among those who were IT competent and those who were not. The atmosphere during the practical sessions became more relaxed as students started to form their own groups and moved around to discuss with other groups. The instructor walked around the laboratory and made herself available to those who wanted help. The instructor's role ceased under these circumstances and acted as a guide. The constructivist learning environment has certainly shifted the role of the instructor's role from the source of all knowledge to a guide where students and the instructor learn and work together. In such learning environment, the students support one another in order to achieve their learning goals and problem solving of tasks (Wilson, 1995).

Conclusion

This research has suggested that students who perceived themselves as IT incompetent tend to benefit more than those who perceived themselves as IT competent when they undergo a discrete IT course taught in a constructivist learning environment.

The results also offered further evidence that IT training taught in such learning environment is able to decrease the differences among participants with differing levels of IT competency in terms of anxiety. This means that students' anxiety level is not dependent on different levels of IT competency after they complete an IT course taught in a constructivist learning environment.

With more positive feelings towards IT, students are more likely to use and integrate IT in the classroom. It is unlikely that teachers would be able to transfer their technology skills, let alone encourage the use of technology among students if teachers have negative attitudes toward technology (Yildrim, 2000). This study, therefore, has offered a possible solution to reduce the anxiety level towards IT when students support one another in order to achieve their learning goals and problem solving of tasks (Wilson, 1995).

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