Computer Usage and Constructivist Approach of the Basic Class: Abilities, Skills and Attitudes of Pre-Service Teachers

Dr. Gamal Ahmed Abdullah Alawi1*, Dr. Mohammed Shwal2 and Dr. Nakhat Nasreen3

Abstract

Computers are the most significant tools of information age, have increasingly been used in each stage of education system. The participants were two hundred and forty (240) pre-service teachers who have participated in this study. The implications discussed for ASCU and AC and suggestions for pre-service teachers’ opinions and attitudes. This paper has designed to study the adoption of the pre-service teachers of the basic class towards the computer usage in three dimensions of their abilities, skills and attitudes. The interaction between these dimensions is the key purpose of this study to integrate technology in existing educational approach and introduce computer technology as an important tool to support new ways of teaching and learning. A model, which explains the effect of CU, AC and ASCU on learning, is established and tested. Using AMOS 18 (Analysis of Moment Structures) program, it explains 55% of CU TOOLS, 77% of ASCU TECHNOLOGY and 55% of AC, with good model fit. As a result, the effectiveness of attitude towards computer (AC) on computer usage (CU) is stronger than other factors in this study.

Keywords: Abilities, Attitude, Computer Usage, Pre-service teachers, Skills

INTRODUCTION

Many teachers perceive adoption of the new technologies as a risky, if not an intimidating change, and therefore quite often faculty members in many higher education institutions are not keen on participating in online initiatives. There are many reasons for this adoption of the new technologies such as distributed teaching responsibility, time consumption and lack of incentives, lack of technological literacy and support systems. (Abel, 2005; Boezeroooy et al., 2002; Guri-Rosenblit, 2004; Kurtz, 2008; Massy and Zemsky, 2004a,b; OECD, 2005; Trucano, 2005).

In the opposite direction, there are few teachers believe that the new communication technologies have the potential to increase the connectivity to faculty members, help them share useful resources, and provide for joint problem solving and shared learning. The most important requirement to this claim is the good practice to encourage active learning, to emphasize time on task, to communicate high expectations and to respect diverse talents and ways of learning (Ehrman, 2002; Guri-Rosenblit, 2004; Harley et al., 2002).

While many factors are at play, the most important are how the computer fits into the teacher’s overall belief system regarding teaching and what other pedagogical techniques teachers use to cover the material. Computers do not replace teachers because; computers will perform a specific role in the classroom. Teachers and students negotiate what this role is and fit it into the other activities that occur in the classroom. Therefore, computer use to solve problems and to manipulate data in different forms that is representing data with a graph and discussing the various potential representations.
between teachers and students (Harold W., 2005).

Computers will help students in elementary and secondary schools to reduce their lack of sufficient knowledge to engage in analysis and synthesis, and consequently spend most time on conveying knowledge (Berends et al., 2002).

To improve educational approach in teaching, both educational research and educational philosophy generally hold that teaching beliefs and practices conform to one of two types of pedagogies, the didactic or the constructivist. Therefore, technology is a better fit with the Constructivist approach than the didactic (Harold, 2005).

However, the constructivist approach is the polar opposite and viewing students as developing linearly from basic to advanced skills, this approach holds that basic skills almost always have to be embedded in advanced skills, both because the advanced problems are more exciting for students to learn and because it helps them get the “big picture.” (Boezerooij, 2006; Borja, 2002; Harold, 2005).

In concert with the constructivist approach, computers become one of many tools students can use to concretize concepts. In other words, the constructivist focus on problem solving means that students do most of the work, computers replace teachers to the extent that teachers have given students the freedom to make their own mistakes and successes on a computer as well as on a field trip or in a lab (Linn and His, 2000).

Digital images, both still and moving, have a range of applications in pre-service teacher education. Video case studies of K-12 practice employed successfully in most programs using a constructivist or process-oriented learning approaches to examine teaching in K-12 classrooms. For example, Reading Classroom Explorer is a web-based software environment housing exemplary video clips of literacy in elementary classrooms accompanied by a complementary notepad, database search engine, additional resources, and online discussions (Ferdig et al., 2002).

Communication technologies, in combination with mentoring by teacher educators, are also valuable in improving the quality of reflection by pre-service teachers' schools. E-mail has been used extensively and online discussion groups with peers have also been found to provide effective support when carefully integrated within the contexts. Such integration includes the development of a community of practice, in which pre-service student teachers are legitimate members (Kirschner et al., 2003; Laferriere et al., 2004).

Therefore, this paper has designed to study the adoption of the pre-service teachers of the basic class towards the computer usage in three dimensions of their abilities, skills and attitudes. The interaction between these dimensions is the key purpose of this study to integrate technology in existing educational approach and introduce computer technology as an important tool to support new ways of teaching and learning.

Related Works

In a comprehensive review of the literature on factors influencing teachers’ adoption of ICT, Mumtaz (2000) posited that teachers’ theories about teaching are central to their decisions to adopt or reject technology. Mumtaz’s emphasis on the importance of teachers’ enthusiasm echoed and strengthened by Law (2008) in her discussion on what motivates teachers to acquire the wide repertoire of knowledge and skills beyond the technical and pedagogical needed for ICT-based pedagogical innovation.

The findings of Kwong and Russell Butson (2013) reported that the participants were selected based on self-reports of their degree of computer literacy. This was measured using that the responses to the five questions relating to computer use and perceived aptitude with computer technology. The findings therefore, showed that while most of the participants reported that their use of computers was predominately for academic purposes, the computer activity data of actual use revealed the reverse. This highlights the considerable disparity between what students’ think they are doing and what they are actually doing when it comes to computer usage.

The discussion of Ong Boon Han et al. (2013) showed that computer technology and developed courseware give significant effects on students’ learning especially in Mathematics. However, there are many problem faces from many aspects such as from teachers, from the courseware itself and so on.

The findings of Mojgan Afshari et al. (2013) study indicated that subjective norm (SN) could be a determinant of students’ attitudes towards computer-assisted language learning (CALL). SN had a direct and indirect effect on students’ attitudes towards CALL.

For computer sciences to have substantial contribute in various human activities. It should make research on computer science domain become more and more interesting to do. Pure and applied research conducted to develop and enrich the knowledge of computer science. Interest of researchers in conducting research in the field of computer science led to a need to know the trend of the future topics (Novita Sari et al., 2012).

Kay’s (2006) review of research concluded that more rigorous and comprehensive research is required into key technology strategies. Additional research in regions beyond the US and Europe is recommended plus a more ecological perspective, which recognizes that ICTs in education requires continuing development of the ecologies of the school, classroom, and of teacher education (Davis, 2008).

Afshari et al. (2013) examined the attitudes of students towards use of computer-assisted language
learning (CALL). Data collected from 100 students using a survey questionnaire. Findings of this study indicated that students had moderate attitudes towards CALL. Moreover, study results indicated that perceived usefulness, perceived ease of use, and subjective norms were significant predictors of computer attitudes. Implications for student training and suggestion for further research provided.

According to Teo (2006), attitudes toward technology play a crucial role in the adoption of instructional technology and students’ learning in the classroom. Attitude also considered as one of the affective variables in the success of implementing technology in the second or foreign language learning process.

Computer technologies can enhance interpersonal and communication skills and can provide opportunities for cooperative learning. Hence, using computers not only increase instructional effectiveness and efficiency, but also promote positive social interactions and enhance students’ motivation for teaching (Afshari et al., 2009).

Objectives

- To analyze the effectiveness of computer usage on the attitudes of pre-service teachers towards using computer in education.
- To study the pre-service teachers’ opinions towards computer technology.
- To generalize the importance of computers in education regarding the pre-service teachers' perspectives.

METHODOLOGY

The method adopted for the present study was descriptive and statistical in nature. It provides a flexible framework for selecting materials and participants, defining criteria and measures, and implementing evaluation techniques. By adapting these different techniques, the proposed structure model for ASCUAC aims to assess the effect of attitudes towards computer (AC) on computer usage (CU), the effect of attitudes towards computer (AC) on abilities and skills of computer usage (ASCU) and the effect of abilities and skills of computer usage (ASCU) on computer usage (CU).

Different statistical techniques were used including instrument development, a confirmatory factor analysis (CFA), an exploratory analysis (Mean (M), Standard Deviation (SD), Principal Component Factor and Cronbach’s alpha, (exploratory factor analysis (EFA) is used to determine how many latent variables should be used)), Construct Reliability, and a test of a structural model. Convergent validity and Discriminant validity were used in this research according to the recommendations of Fornell and Larcker (1981a) and Koufteros et al. (2001).

There are twenty-four observed (endogenous) variables, which are CU1 ... CU8, AC1 ... AC8 and ASCU1 ... ASCU8 and there are three unobserved (exogenous) variables, which are CU, AC and ASCU respectively.

To assess the fit of the model to the data, Chi-square per degrees of freedom, GFI, AGFI, CFI, RMSR, RMSEA, and MI computed. If the model fits the data adequately, the t-values of the structural coefficients evaluated to test the research hypotheses. Figure 1 illustrates proposed ASCUAC Model below.

Population and Sample

The difficulty of studying the whole population enforces
the researchers randomly choose a sample of 240 of pre-service teachers in the category of the basic class. Out of which 60 were of Basic English Language, 60 were of Basic Mathematics, 60 were of Basic Biology and 60 were of Basic Science. All of them had enough knowledge of computer and mobile devices and searched information using different engines (Google and Yahoo search engines) before this study. Therefore, the total of usable responses was 240, which means there were not missing responses and whole the questionnaire for 240 participants completed successfully.

**Descriptions of the Tool Used and Construct Measures**

In this study, the data were collected via a questionnaire survey of Likert 5-point scale format (one = strongly disagree, two = disagree, three = neutral, four = agree and five = strongly agree). The design of the questionnaire follows the stages outlined by A. Albirini (2006) in the case of computer. Content validity was ensured through a comprehensive review of the literature and interviews with practitioners, i.e., the indicators in the questionnaire were based on previous studies (Albirini, 2006), interviews and discussions with practitioners and a number of experts in computer technology.

The items in the questionnaire were judged as relevant by 8 indicators for each of CU, AC and ASCU factors. Therefore, the total of observed variables is 24. The interviews resulted in minor modifications to some words provided in some measurement items, which finally accepted as possessing content validity. The refined measurement items were included in the final survey questionnaire administered to the target respondents.

**Data Collection**

Collection of data is an important phase in any research work. Various difficulties generally felt by the investigators who collecting data. In the present study, the data was to collect from four departments of basic class final year in Taiz University (TU) – Yemen Country.

Before approaching the subjects in various departments, the researchers first took permission from the chairpersons of the respective departments for survey.

In order to collect the systematic data, it was essential to approach subjects and the investigators did the same. After contacting participants, the investigators explained the objectives of the study to them. The respondents assured that the information provided by them would keep strictly confidential.

The questionnaire used for ASCUAC and included three parts (for CU, AC and ASCU) tests, which consisted of total twenty-four questions.

Then the investigators distributed the questionnaire among the participants. They asked to go through the general instructions given on the top of them before filling the given entries. Lastly, the participants asked to read the statements carefully and requested to give their responses to every statement. Doubts and confusions were clear by the investigators as per the requirements of the participants.

The investigators also gave full freedom to the participants to ask the meaning of the words or sentences which were beyond their understanding.

**Statistical Techniques Used**

The analysis of data did by using statistical techniques, which chosen only after the investigators found them to be most appropriate and compatible for the collected data. This analysis was depended on the previous studies of Gamal and Nasreen (2013), Koufteros (1999) and Koufteros et al. (2001). These statistical techniques were included instrument development, a confirmatory factor analysis (CFA), an exploratory analysis (Mean (M), Standard Deviation (SD), Principal Component Factor and Cronbach’s alpha, exploratory factor analysis (EFA) is used to determine how many latent variables should be used), Construct Reliability, and a test of a structural model.

However, convergent validity assessed by examining the significance of individual item loadings through t-tests. The overall fit of a hypothesized model can test using the maximum likelihood Chi-square statistic provided in the Amos (a software package for SEM) output. Other fit indices such as the ratio of Chi-square to degrees of freedom, goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), root mean residual (RMR), the root mean square error of approximation (RMSEA), and The Tucker Lewis Index (TLI). Discriminant validity was assessed by comparing the average variance extracted (AVE) to the squared correlation between constructs.

The AVE estimate is a complimentary measure to the measure of composite reliability (Fornell and Larcker, 1981a; Koufteros et al., 2001).

**Research hypotheses**

Based on the research framework (see figure1), the ASCUAC model originally defined computer usage (CU), attitudes towards computer (AC) and abilities and skills of computer usage (ASCU) as three main factors. Each factor consisted of eight observed variables.

Many studies concentrated on efficiency, influences,
ability, and achievement of using interactive computer technology, attitudes towards computer and computer-based learning (Mojgan, 2013; Afshari et al., 2009; Teo, 2006; Davis, 2008; Novita et al., 2012; Kwong and Butson, 2013).

It is therefore reasonable to expect that AC may have a positive effect on a computer usage (CU) and abilities and skills of computer usage (ASCU). Abilities and skills of computer usage (ASCU) may have a positive effect on a computer usage (CU). Thus, the researchers hypothesize that:

H1: Attitudes towards computer (AC) has a positive effect on a computer usage (CU).
H2: Attitudes towards computer (AC) has a positive effect on the abilities and skills of computer usage (ASCU).
H3: Abilities and skills of computer usage (ASCU) have a positive effect on a computer usage (CU).

Instruments

As mentioned above the questionnaire was composed of 24 questions concerning the ASCUAC (Cronbach’s Alpha $\alpha= 0.753$).

ANALYSIS AND RESULTS

Coefficient Alpha and Reliability

Cronbach’s alpha is used for evaluating reliability (Koufteros, 1999). The Cronbach’s alpha value for each measure shown in Table 1. The reliability value for each construct was well above the value of 0.7, which considered satisfactory for basic research (Nunnally, 1978; Churchill, 1991; Litwin, 1995). Nevertheless, Cronbach’s alpha has several disadvantages, one of them that Cronbach’s alpha cannot be used to infer unidimensionality (Gerbing and Anderson, 1988). (Table 1)

Construct Reliability and Variance Extracted Measures

The reliability and variance extracted measures for each construct are needed to assess whether the specified items represent the constructs, sufficiently. The reliability of a construct can be estimated using AMOS 18 output.

Construct reliability means that a set of latent indicators of constructs are consistent in their measurement. In more formal terms, this reliability which is the degree to which a set of two or more indicators share the measurement of a construct. Highly reliable constructs are those in which the indicators are highly inter-correlated, indicating that they are all measuring the same latent construct. The range of values for reliability is between 0 and 1. Computations for each construct is shown in Table 2.

The reliability of the constructs of attitudes towards computer, computer usage, and abilities and skills of computer usage were 0.80, 0.73, and 0.873, respectively. All constructs exceeded the recommended level of 0.70 (Hair et al., 1998).

Results of Hypothesis Testing

The model’s overall fit with the data evaluated using common model goodness-of-fit measures estimated by AMOS 18 (Analysis of Moment Structures) program; it explained 55% of CU TOOLS, 77% of ASCU TECHNOLOGY and 55% of AC, with good model fit see figure 2. Overall, this model exhibited a reasonable fit with the data collected. (Figure 2)

Based on the data, the AMOS estimation of this model showed a value of 1.722 in the Chi-square to degree of
Table 2. Descriptive statistics and constructive reliability for each construction

<table>
<thead>
<tr>
<th>Measures</th>
<th>Mean(^a)</th>
<th>S.D.(^b)</th>
<th>Constructive reliability(^c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>36.9032</td>
<td>4.70326</td>
<td>0.80</td>
</tr>
<tr>
<td>(AC1, AC2, AC3, AC4, AC5, AC6, AC7, AC8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASCU</td>
<td>17.3871</td>
<td>8.17763</td>
<td>0.873</td>
</tr>
<tr>
<td>(ASCU1, ASCU2, ASCU3, ASCU4, ASCU5, ASCU6, ASCU7, ASCU8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CU</td>
<td>31.9919</td>
<td>4.47667</td>
<td>0.73</td>
</tr>
<tr>
<td>(CU1, CU2, CU3, CU4, CU5, CU6, CU7, CU8)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(a\) The mean scores of attitude towards computer, abilities and skills of computer usage and computer usage

\(b\) SD = standard deviation.

\(c\) Construct reliability = \((\text{sum of standardized loadings})^2 / (\text{sum of standardized loadings})^2 + (\text{sum of indicator measurement error})\).

Figure 2. AscuaC unstandardized model

freedom ratio, which is satisfactory with respect to the commonly recommended value of less than 2.0. We assessed the model fit using other common fit indices: goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), root mean square residual (RMSR), root mean square error of approximation (RMSEA), standardized residual, and modification index (MI). The model exhibited a fit value exceeding or close to the commonly recommended threshold for the respective indices, e.g., values of GFI=0.986, AGFI=0.940, RMR=0.022, CFI=0.951, TLI=0.922, RMESA=0.077, satisfactory with respect to the commonly recommended values.

The hypotheses also tested as shown in Figure 3. As summarized in Table3, the attitude towards computer (AC) and computer usage (CU) was supported by the data, as indicated by a significant critical ratio (C.R. = 3.099). The C.R. is a t-value obtained by dividing the estimate of the covariance by its standard error. A value exceeding 1.96 represents a level of significance of 0.05. Therefore, the attitude towards computer (AC) has positive effect on computer usage (CU) (H1).

This reflects that attitude towards computer was the most important determinant of ASCUAC throughout this
research. Attitude towards computer (AC) has a positive effect on the abilities and skills of computer usage (ASCU) (C.R. = 2.871 (H2)). In addition, it found that the effect of abilities and skills of computer usage (ASCU) on the computer usage (CU) was significant (C.R. = 3.010 (H3)).

In sum, the tests of the structural model showed that the three hypotheses were fulfilled in this research as shown in the table3 below. (Figure 3)

**Calculated Variance Extracted (AVE)**

Evidence of discriminant validity provided by the AVE method. The AVE for the latent variables via CU, ASCU and AC was 0.7717250.786888 and 0.810663, respectively. The results have demonstrated evidence of discriminant validity for the study constructs.

**DISCUSSION AND CONCLUSION**

This study tends to identify, within the framework of (Afshari, 2013; Afshari et al., 2009; Teo, 2006; Davis, 2008; Novita et al., 2012; Kwong and Butson, 2013).

It has investigated the underlying relationships between attitudes towards computer, computer usage and abilities and skills of computer usage which support learning and teaching for basic class. All hypotheses postulated by the structural model supported. As a result, the effectiveness of attitude towards computer (AC) on computer usage (CU) is stronger than other factors in this study.

Having its stronger impact on reading, listening, and watching activities, it is emphasized that computer is required in basic class particularly for receiving knowledge through multimedia anywhere and anytime in academics and research. Using the internet connection...
of many Journals and Magazines encourages teachers of basic class and researchers to interact with computer and Internet.

In addition, researchers may build on this model to identify and examine other factors that may influence learning to use computer such as the Internet skills, mobile learning and e learning, including the level of information technology in the organizations and computer resources. The integration of these constructs into the model will help researchers; further grasp the factors influencing the development of electronic learning in the schools and universities.

Therefore, it is significant that multimedia as a technique or a tool of learning should be more widespread, and faculty members in higher education and basic class teachers should support with technical and technological equipment and the process should institutionalize via the policies and strategies of Schools and Universities (Gamal Ahmed Abdullah and Nasreen, 2013).

REFERENCES


