Using constructivist and collaborative approach to enhance pre-service teachers’ attitude toward computer in computer course: Learning and using MS Excel functions in problem-based scenarios

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Abstract

The purpose of present research is to determine the difference between teacher centered training & individual application process (TCT&Iapp) group and problem-based scenarios & collaborative application process (PBS&Capp) group according to their attitudes toward computer (AtC) by an experimental design process. The study group of the research includes 125 pre-service teachers attending to department of primary school teacher education program. TCT&Iapp group (n=65) was assigned as control group and the PBS&Capp group (n=60) was assigned as experimental group. The application continued six weeks period during four course hours in a week. The results of the study reveal that the AtC scores of the students in PBS&Capp group are significantly higher than scores of TCT&Iapp group.

Keywords: Computer course, constructivism, collaborative group, attitude toward computer, problem-based scenarios, MS Excel functions, pre-service teachers

1. Introduction

For the last few decades, constructivism has been most important paradigm to guide learning, teaching, and organizing in class applications to provide and support best learning environments and opportunities for students (Fosnot, 2006; Tsai, 2008). According to the constructivist approach, learning is an effortful and a mindful process so that pre-service teachers could be encouraged to construct their own knowledge through active processing (Berkant, 2009; Young & Maxwell, 2007) rather than being passive listeners (Konings, Brand-Gruwel, & van Merriënboer, 2005; Lindgren, 2005; Niaz, 2008; Vosniadou et al., 2001). Therefore, learning environments designed by the constructivist teachers should allow students to participate actively in the learning process. On the other hand, one of the important characteristics of constructivism is the use of knowledge in real life problems to provide deeper learning and retention. Deeper learning and acquisition of competence and skills are the most important

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specifications for achieving individual, organizational or course goals (Niemi, 2002), and are vital for teachers’ professional developments. Moreover, one of the key factors in the process of teachers’ professional development is their use of information communication technologies (ICT) in classroom applications (Karasavvidis, 2009; Kirschner & Wopereis, 2003; Usun, 2009; Wang, 2009; Zhao, 2003). Therefore, to ensure the ICT competence of pre-service teachers, ICT courses have been established in teacher education curricula all around the world (Altun, 2007; NCATE, 2008). However, only integrating ICT courses in teacher education curricula may be insufficient. In addition, pre-service teachers’ affective specifications such as beliefs and attitudes (Belland, 2009; Efendioğlu, 2012) should be taken into consideration during the application of ICT course (Efendioğlu & Yanpar Yelken, 2009; Johnson, Johnson, & Smith, 1991).

1.1. Background of the research

For pre-service teachers, using ICT in classroom applications effectively is vital for both providing their students’ with the understanding of the course subjects meaningfully and applying the constructivist approach for providing new learning opportunities in the future. Hence, before they applied in classroom, pre-service teachers had learned ICT tools, subject-related knowledge, and gained important skills they could need (Haydn & Barton, 2007; Loveless, Burton, & Turvey, 2006). Pre-service teachers can learn these important specifications by applying the problem-based scenario(s) (PBS) in their learning processes in basic computer courses (Chang et al., 2012; Hou, 2011; Hou, Chang, & Sung, 2007). Hence, they can prepare and solve PBS establishing the connections among different disciplines in collaborative group activities. Moreover PBS may lead to the increase of their attitudes towards the subject or the course they try to learn (Chang et al., 2012). Weinburg and Englehard Jr (1994) explain the attitude as one of the key factors in teaching and learning process. According to Fishbein and Ajzen (1975), attitudes affect future behaviors of students. Moreover, one of the functions of attitude is subject knowledge, and it is directly related to academic achievement (Katz, 1960). Eventually, educational activities should be designed for gaining content knowledge, skills and affective specifications by the pre-service teachers.

2. Purpose of Study

The purpose of this study is to determine the difference between the teacher centered training & individual application process (TCT&Iapp) group and problem-based scenarios & collaborative application process (PBS&Capp) group based on their attitudes toward computer (AtC).

3. Method

In this study, an experimental design including pre-test and post-test group was used. The study group includes the students attending to the department of primary school teacher education program in Çukurova University and taking Computer-II course in the second semester of their first year in the university. The study group includes 125 pre-service teachers randomly selected among 240 primary school teacher candidates attending the course in six different classes. The contents of the Computer-II course comprises MS Excel, MS Access applications and computer assisted instructional methods, and the course includes learning and using 23 functions (sum, average, if, or, and, ifcount, isnull, left, right, correl, min, max, fact, sqrt, sumsq, countblank, count, counta, large, small, concatenate, mid, sumif) in MS Excel software during the six weeks period. Also, the study group was randomly partitioned into two groups. TCT&Iapp group (n=65) was designated as the control group, and the PBS&Capp group (n=60) was designated as the experimental group. The distribution of the pre-service teachers based on their genders and ages is shown in Table 1.

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Genders</th>
<th>Average Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>TCT&amp;Iapp</td>
<td>65</td>
<td>28</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19.46</td>
<td>19.03</td>
</tr>
</tbody>
</table>

Table 1. Distributions of pre-service students in research groups
3.1. Procedure in Control group-TCT&Iapp

In this group, teacher-centered training and individual application process (TCT&Iapp) was used in the six weeks period during four course hours a week. In each week, during first two course hours, teacher explained three/four different MS Excel functions by using his own problem-based scenarios, then last two course hours, pre-service teachers prepared individually their own simple MS Excel examples and used functions in their examples, which the teacher had explained in the first two course hours in computer laboratory. Eventually, they sent their MS Excel files to teacher via email.

3.2. Procedure in Experimental groups-PBS&Capp

In this group, problem-based scenarios and collaborative application process (PBS&Capp) was used in the six weeks period during four course hours a week. Firstly, the group was partitioned into small collaborative pre-service teacher group(s) (CPSTG) with six/seven members in each group. Then the teacher presented via projection a sample of PBS and used five different MS Excel functions, apart from the 23 functions used in this research, for solving the PBS. Also, he explained the feature of PBS and answered the pre-service teachers’ questions. Thereafter, research started and in each week all CPSTG worked with the same three/four MS excel functions in PBS, which was created by CPSTG by applying the collaborative group discussion. At the end of each week, all CPSTG presented their own PBS, functions they used for solving their PBS via projection in computer laboratory, and prepared a PBS report.

3.3. Attitude toward computer scale (AtCS)

Attitude toward computer scale (AtCS) was developed by Berberoğlu and Çalışkoğlu (1991). The scale has 40 items and each item includes choices as “strongly agree, agree, moderate, disagree, strongly disagree”. They tested the scale on 282 students enrolled in the Middle East Technical University and Ankara University, and reported Cronbach’s alpha reliability coefficient of the scale as 0.93. Cronbach’s alpha of AtCS is also calculated in our study and found to be 0.91. AtCS was used as pre-test and post-test in TCT&Iapp and PBS&Capp groups.

3.4. Data Analysis

Data are analyzed by using descriptive statistics, independent sample t-test and ANCOVA methods via SPSS 15.0 program.

4. Findings

T-test results for pre-AtC scores of TCT&Iapp and PBS&Capp groups are shown in Table 2.

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>X</th>
<th>sd</th>
<th>df</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCT&amp;Iapp</td>
<td>65</td>
<td>155.60</td>
<td>17.34</td>
<td>123</td>
<td>2.690</td>
<td>0.008*</td>
</tr>
<tr>
<td>PBS&amp;Capp</td>
<td>60</td>
<td>146.58</td>
<td>19.30</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < 0.01.

As shown in Table 2, there is a meaningful difference between the TCT&Iapp and PBS&Capp groups’ pre-AtC average scores in favor of TCT&Iapp group, $t_{(123)}=2.690$, $p < 0.01$. Also, the ANCOVA results of the post-AtC average scores of the groups are shown in Table 3.
Table 3. ANCOVA results for post-AtC scores of TCT&Iapp and PBS&Capp groups

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig. (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total pre-attitude</td>
<td>461.507</td>
<td>1</td>
<td>461.507</td>
<td>1.476</td>
<td>0.227</td>
</tr>
<tr>
<td>Group</td>
<td>2041.022</td>
<td>1</td>
<td>2041.022</td>
<td>6.528</td>
<td>0.012a</td>
</tr>
<tr>
<td>Error</td>
<td>38141.642</td>
<td>122</td>
<td>312.636</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>40306.928</td>
<td>124</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a p < 0.05

As shown in Table 3, there is a meaningful difference between TCT&Iapp and PBS&Capp groups’ post-AtC scores, F(1,122)=6.528, p<0.05. Also, results for the pairwise comparisons of the groups are shown in Table 4.

Table 4. Pairwise comparisons and descriptive statistics

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Means</th>
<th>Means*</th>
<th>Sig. (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCT&amp;Iapp</td>
<td>65</td>
<td>155.48</td>
<td>155.03</td>
<td>0.012b</td>
</tr>
<tr>
<td>PBS&amp;Capp</td>
<td>60</td>
<td>162.87</td>
<td>163.35</td>
<td></td>
</tr>
</tbody>
</table>

a Covariates appearing in the model are evaluated at the following values: 151.368
b Adjustment for multiple comparisons: Bonferroni.

As shown in Table 4, there is a meaningful difference between TCT&Iapp and PBS&Capp groups’ post-AtC scores in favor of PBS&Capp group.

5. Results and Discussions

In this study, it is shown that AtC of PBS&Capp group is significantly higher than AtC of TCT&Iapp group. The scenarios that were created in PBS&Capp group were designed in terms of the problems they may face in their professional environment. While the students of PBS&Capp group designing these scenarios are working in their professions, they could realize the need for the computer assistance. This situation is accepted as a positive factor increasing their AtC. Moreover, the flexibility of the method used in this group and its characteristic that gives the learning responsibility completely to the student could also increase the AtC. In a study it is determined that the GroupScribbles (GS) software technology classes performed better than non-GS classes. GS facilitated students’ collaborative learning and attitudes toward science learning (Looi, Chen, & Ng, 2010). As an experimental result, technology-based implications not only promotes the students’ learning interest and attitude, but also improves their learning achievement (Hwang & Chang, 2011). In PBS&Capp group collaborative learning environment was designed. In a collaborative group learning process, members of the group work together and help each other. This feature reduces their cognitive load and they can learn the knowledge easily. If a student learns easily, his/her intention, beliefs and performance about learning content or tool may increase positively. Liaw, Chen and Huang (2008) state that computer technology supports learning performance of students that study in collaborative learning groups. As Hsu et al. (2007) states, some factors such as specific computer collective efficacy can strongly influence a team’s software learning performance.

Additionally, technology-supported and collaborative learning environments may correlate with the professional specifications. Francescato et al. (2006) finds that computer-supported collaborative learning environments are efficient in increasing professional competencies. According to the results of Kollias et al. (2005), the teachers were positive about collaborative learning environments and their possible role in initiating pedagogical innovation and enhancing personal professional development.

Based on the results of this study, it may be proposed that the implications and activities of PBS&Capp group are useable for increasing AtC. In another study, the implications of PBS&Capp group can be studied in terms of its correlation with academic achievement, and a qualitative research design may be used.
Acknowledgments

This research was funded by Çukurova University Scientific Research Projects Unit with the number EF2012BAP9.

References


