5th World Conference on Educational Sciences - WCES 2013

Exploring the self-confidence of preservice science and physics teachers towards technological pedagogical content knowledge

Murat Berat Uçar *, Cihat Demir, Emrah Hiğde

Dicle University, Ziya Gökalp Education Faculty, Department of Primary Education, 21280, Diyarbakır, Turkey

Abstract

The aim of this study is to investigate the self-confidence of science and physics teacher candidates towards technological pedagogical content knowledge. Moreover, it was also examined the relationship among computer use habits of those teacher candidates and their confidence level towards technological pedagogical content knowledge. A total of 150 participants who were 75 preservice science teachers and 75 preservice physics teachers studying at Dicle University were involved to the study as convenient sample. The data collection tool was the Technological Pedagogical Content Knowledge Confidence Scale, a thirty-one items scale, developed by (Graham, et al., 2009), and translated and adapted into Turkish by (Timur & Taşar, 2011). The participants’ confidence was investigated by the four dimensions of the scale which are Technological Pedagogical Content Knowledge, Technological Pedagogical Knowledge, Technological Content Knowledge, and Technological Knowledge. The results of the study revealed that technological pedagogical content knowledge self-confidence of preservice science and physics teachers did not significantly differ from each other on the gender and department basis but their computer use frequencies affected the confidence levels of preservice science teachers.

© 2013 The Authors. Published by Elsevier Ltd. Open access under CC BY-NC-ND license. Selection and/or peer-review under responsibility of Academic World Education and Research Center.

Keywords: Preservice science teachers, preservice physics teachers, technological pedagogical content knowledge, self-confidence;

1. Introduction

The importance of the necessity of having adequate computer and internet use skills is accepted by everybody. From primary education program to even higher education program, there is plenty of courses related to computer and internet use at different levels. Since reaching and presenting information is easy and economic with computer technology, many students, teachers, educators prefer using those tools like different computer software and hardware. Today’s society seeks out individuals who are effectively using information and technology in their lives. This demand resulted in changing from traditional educational approaches to newer ones which suggests training students who are inquiring, transferring knowledge to real life and utilizing technology to accomplish this mission. There are more reasons to possessing enough technology use skills in education such as necessary of spreading out information rapidly, constructing individual learning environments, presenting cooperatively and globally studying possibility, and motivating to learning information (İşman & Eskiçumali, Eğitimde Planlama ve Değerlendirme, 2003).

* Corresponding Author: Murat Berat UÇAR Tel: +90-412-2488030-8857 E-mail: murath.ucar@dicle.edu.tr
In order to raise modern individuals for the information age, it is needed that teachers, who will raise those individuals, have sufficient computer and technology use ability as well as pedagogical content knowledge. In recent years, this technology use ability has been combined with pedagogical content knowledge so that technological pedagogical content knowledge (TPACK or TPCK) term took place in the literature. According to Mishra and Koehler (2006) TPACK framework provides effective teaching with technology so as to teach content using technologies with appropriate pedagogical techniques. To illustrate, there are some research showing that utilizing information and communication technologies to teach scientific knowledge by science teachers increases the student achievement (Koehler & Mishra, 2005; Niederhauser & Stoddart, 2001; Pektaş, Türkmen, & Solak, 2006).

Today, since it is an essentiality to follow scientific and technological developments for especially science and physics teachers, transporting information and communication technologies into educational environments and using them effectively is important. Therefore, teacher proficiency should comprise the TPACK proficiencies (Timur & Taşar, 2011). One of the factors that determine use of technology of teachers is self-confidence of themselves (Oral, 2008).

This study intends to explore preservice science and physics teachers’ self-confidence towards technological pedagogical content knowledge by comparing of gender, department, and internet and computer use trends variables.

2. Method

2.1. Research model

This study can be described as a descriptive model and a survey research, which aiming to explore preservice science and physics teachers’ self-confidence towards TPACK.

2.2. Research sample

As a convenience sample, accessible 75 preservice science teachers from total of 140 students, and accessible 75 preservice physics teachers from total of 110 students in Dicle University in 2012-2013 academic year fall semester were selected.

2.3. Data collection tool

The main scale for collecting data for this study was the TPACK self-confidence scale, and it had been developed by Graham et al. (2009) and translated and adapted into Turkish by Timur and Taşar (2011). The scale consists of 31 items and each item was five-point Likert-type (except five items which was six-point Likert-type). The reliability coefficient of whole scale was .93. Moreover, a personal information questionnaire including gender, department and the like was also conducted.

3. Findings

3.1 Preservice science and physics teachers’ pedagogical content knowledge self confidence

First table (Table 1) shows that both preservice science and physics teachers’ TPACK scale scores in terms of total averages and standard deviations. The average of preservice science teachers’ scores was found 117, which varies from 29 to 153, and average of preservice physics teachers’ scores was found 113, varying between 77 to 146. Moreover, a t-test was conducted to check out whether significant difference emerged between preservice science and physics teachers on the basis of their department. As can be seen from Table 1 below, there is no statistically significant difference of the TPACK self-confidence scores (p<.05).

<table>
<thead>
<tr>
<th>Department</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>X</th>
<th>S</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
</table>

Table 1. The comparison of t test of the preservice science and physics teachers TPACK self-confidence scores based on the department
3.2 The gender and preservice science and physics teachers’ pedagogical content knowledge self confidence

In order to determine gender effect on TPACK self-confidence scores of preservice science and physics teachers, an independent t-test was conducted for both department students separately. According to the p values, there is no statistically significant difference between female and male students on TPACK self-confidence scores (p<.05).

Table 2. The comparison of t test of the preservice science and physics teachers TPACK self-confidence scores based on the gender

<table>
<thead>
<tr>
<th>Department</th>
<th>Gender</th>
<th>N</th>
<th>X</th>
<th>S</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
<td>Female</td>
<td>53</td>
<td>115.72</td>
<td>15.68</td>
<td>0.549</td>
<td>0.680</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>22</td>
<td>118.82</td>
<td>33.37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics</td>
<td>Female</td>
<td>52</td>
<td>113.06</td>
<td>16.31</td>
<td>0.299</td>
<td>0.766</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>23</td>
<td>111.93</td>
<td>11.39</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

p<.05

3.3. The computer use amount effect of preservice science and physics teachers’ pedagogical content knowledge self confidence

Table 3 and 4 depicts that computer use amount versus the preservice science teachers’ TPACK self-confidence scores. According to One-way ANOVA analysis, there is statistically significant difference among groups. The Dunnett test showed that those students using computer everyday differed from those who use computer less than a day per week, and those who use computers nearly never. These differences have been found in only preservice science teachers’ scores not physics students.

Table 3. The averages and standard deviations concerning the scores preservice science teachers’ TPACK self-confidence scale scores according to amount of computer use

<table>
<thead>
<tr>
<th>Amount of computer use</th>
<th>N</th>
<th>X</th>
<th>Ss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Everyday</td>
<td>26</td>
<td>133.23</td>
<td>7.56</td>
</tr>
<tr>
<td>Several days per week</td>
<td>23</td>
<td>121.55</td>
<td>15.53</td>
</tr>
<tr>
<td>One day per week</td>
<td>12</td>
<td>115.95</td>
<td>8.34</td>
</tr>
<tr>
<td>Less than one day per week</td>
<td>10</td>
<td>114.20</td>
<td>4.39</td>
</tr>
<tr>
<td>Never</td>
<td></td>
<td>58.40</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Table 4. Variance analysis results concerning the scores preservice science teachers received from the scale of web pedagogical content knowledge according to frequency of internet usage of pre-service teachers

<table>
<thead>
<tr>
<th>Source of variance</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Squares average</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intergroups</td>
<td>20311.75</td>
<td>4</td>
<td>5077.94</td>
<td>22.002</td>
<td>0.000</td>
</tr>
<tr>
<td>Intragroups</td>
<td>15694.21</td>
<td>68</td>
<td>230.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>36005.96</td>
<td>72</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

p<.05

4. Discussion

Based on the results of this study, the self-confidence towards technological pedagogical content knowledge of preservice science teachers and preservice physics teachers was high. However, the preservice science students’
self-confidence was slightly higher than the preservice physics teachers. Actually, similar results about participant TPACK self-confidence have reported in different studies (Smarkola, 2008). Moreover, the scores of TPACK self-confidence of both preservice science and physics teachers on the gender basis indicated no significant differences as parallel to Koseoglu (2012) while some studies investigating self-confidence and technology knowledge (Lin, Tsai, Chai, & Lee, 2012) and attitude toward technology (İşman & Çelikli, 2009) state different consequences. Additionally, both preservice science and physics teachers who use computers everyday as compared to those who use a day in a week or less have higher self-confidence in towards TPACK. Hence, it could be concluded that more time spending or on using computer might lead to increase self-confidence towards TPACK. Nevertheless, to get better implications and more illuminating conclusions, it is needed to investigate with larger samples.

References