Differences in teacher candidates’ attitudes toward science according to some psycho-social variables

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Abstract

Teachers are expected to have positive attitude toward science to equip students with scientific thinking abilities. In this descriptive study, the attitudes of the teacher candidates toward science are evaluated with the Attitudes toward Science Scale, developed by Patrick A. Vitale and Brenda K. Johnson in 1988. The differences in attitudes were evaluated according to some psycho-social variables gathered through a personal information form. The results indicated that students perceived instrumental value of science and difficulty and complexities of science differently depending on their department. Another important finding is that students who want to apply for a doctoral program perceive the instrumental value of science differently from students who are not preferred to apply for a doctoral study. Also, the perception of the participants about difficulty and complexities of science differ according to the place they lived most of their life time as town, city or metropolitan.

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1. Introduction

People need to understand their social and physical environment truly and to do this, they have to make judgments. In daily life, judgment sources as “traditions, authority figures, individual experiences, scientific knowledge” (Karasar, 1999, p.5) influence validity of our decisions.

In order to understand the world truly people need to understand science. Scientific knowledge improves our perception of the world and also enhances our intellectual level of knowledge and understanding (Yıldırım, 1973, p.202). Science provides us with an early warning system (Sagan, 2000, p.39). Scientific thinking abilities are important both for daily life and for educational process.

Individuals organize their social relations according to a definite thinking model. In other words people organize their social behaviours according to their intellectual patterns. This intellectual pattern of thinking referred to “attitudes” in social psychology (Tolan et.al, 1985, p.258). In general, attitudes are defined as a predisposition to
respond positively or negatively to things, people, places, or ideas (Simpson et al., 1994, p. 212). Attitudes are not an inborn characteristic; but people learn it during their life (Kağıtçıbaşı, 1988, p. 100).

Attitudes are composed of more general forms of behaviour (Ünal, 1981, p. 12) and reflect the cultural and social norms of the society. Therefore, it is important to study on attitudes. It contains affective, cognitive, and behavioural components (Simpson et al., 1994). There is a strong relationship between affective and cognitive components. Oppenheim (1992) differentiates between different levels of attitudes that include cognitive and affective dimensions. Whereas “beliefs” and “images” are associated with the cognitive dimension illustrating what a person knows, the terms “values” and “personality” describe the affective dimension.

The attitudes toward science include both cognitive and affective dimensions of the attitude. Teachers should develop positive attitudes toward science to equip their students with the scientific thinking abilities as defining the problems, collecting the data, analyzing, and explaining the patterns and solving the problems. For this reason, teachers should have the high level of positive attitudes toward science.

The attitudes toward science refer to whether a person likes or dislikes science, or has “a positive or negative feeling about science” (Koballa & Crawley, 1985, p. 223). Koballa & Crawley (1985), and Koballa (1988) find that attitudes toward science cannot be observed directly but can be based upon descriptive beliefs. It can be observed as a positive or negative feeling about science. Koballa (1988) considers statements such as I like science or I love to teach science as expressions of attitudes toward science.

In this descriptive study, the attitudes of the teacher candidates toward science are investigated using Attitudes toward Science Scale”, developed by Vitale and Johnson in 1988.

The attitudes of the student teachers toward science investigated according to different variables as gender, field of study (department), parents’ educational level, type of the residential area, academic self assessment, the attitudes toward the teaching profession, and willingness to apply for a doctoral study.

2. Methodology

In this descriptive study researchers investigated the attitude differences of the teacher candidates toward science according to some psycho-social variables.

85 teacher candidates from two departments (Turkish Language and Literature and Mathematics), attended teaching certificate program at 2008-2009 academic years, composed the sample of the study.

The translated and adapted version of the “Attitudes toward Science Scale”, developed by Vitale and Johnson in 1988, was used. The scale composed of four factors each of which assesses the different dimensions of attitudes toward science. The first factor “Instrumental Value of Science” assesses how a student perceive the science such as an instrumental tool as the effect of sciences on making the world better place to live, improving the standard of living of people in the country. A high score on factor 1 means that science had some instrumental value for the students. In the second factor, “Active Participation in Science”, science activities inside and outside of the school are regarded. Students who score high on this dimension perceive science as a subject in which students participate actively. The third factor “Difficulty and Complexities of Science” deals with whether the students find science a difficult subject to comprehend. This factor focuses on whether students blame on science of making world too complex and whether most of the anxiety in the society today is due to the science. The fourth factor, “General Attitude toward School” reflects the negative feeling toward school. The factor analytic studies of the scale indicated that factor 1 has .99, factor 2 has .81, factor 3 has .74, and factor 4 has .55 reliability levels (Vitale & Johnson, 1988, p. 1016). Cronbach Alpha reliability of the Turkish version of the scale is .76.

In addition to the “Attitude toward Science Scale”, a “Personal Information Form” was collected from each participant. The form includes 9 questions about the participants. The participants’ backgrounds on department, gender, education level of the family, residential area, academic self concept, intellectual self concept, teaching profession and desire to apply for a doctoral program are gathered through this form.
3. Results and Discussion

The result indicated that there is no significant difference among in the attitudes of the participants toward science according to their gender, education level of the family, academic and intellectual self concept and perception about the teaching profession.

On the other hand, significant differences was found between department and instrumental value of science; department and difficulty and complexities of science; desire to apply a doctoral program and instrumental value of science; residential area and difficulty and complexities of science.

Table 1 shows t-test results about the participants’ view on instrumental value of science according to their department.

<table>
<thead>
<tr>
<th>Department</th>
<th>N</th>
<th>Mean</th>
<th>S</th>
<th>df</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkish Language and Literature</td>
<td>52</td>
<td>61.07</td>
<td>.78</td>
<td>83</td>
<td>5.10</td>
<td>.00</td>
</tr>
<tr>
<td>Mathematics</td>
<td>33</td>
<td>55.33</td>
<td>.46</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The attitudes of the teacher candidates toward instrumental value of science differ according to their field of study \(t (83) = 5.10, p<.01\). The students in the department of Turkish Language and Literature perceive instrumental value of science more positively \(\bar{x} = 61.07\) compared to the students in the department of Mathematics \(\bar{x} = 55.33\).

Table 2. Department and “difficulty and complexities of science”

<table>
<thead>
<tr>
<th>Department</th>
<th>N</th>
<th>Mean</th>
<th>S</th>
<th>df</th>
<th>T</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkish Language and Literature</td>
<td>52</td>
<td>8.26</td>
<td>2.85</td>
<td>83</td>
<td>2.68</td>
<td>.009</td>
</tr>
<tr>
<td>Mathematics</td>
<td>33</td>
<td>8.12</td>
<td>2.55</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As it is seen from t-test result in Table 2, teacher candidates perceive difficulty and complexities of science differently according to their department \(t (83) = 2.68, p<.01\). Turkish Language and Literature students \(\bar{x} = 8.26\) believe that science is a difficult and complex subject comparing Mathematics students \(\bar{x} = 8.12\).

Table 3. Desire to apply for a doctoral study and “Instrumental value of science”

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>S</th>
<th>df</th>
<th>T</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>57</td>
<td>60.73</td>
<td>4.69</td>
<td>83</td>
<td>4.86</td>
<td>.00</td>
</tr>
<tr>
<td>No</td>
<td>28</td>
<td>55.00</td>
<td>5.89</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

T-test result in Table 3 shows the participants who want to apply a doctoral program and who would not desire to apply a doctoral program and conception differences in the instrumental value of science \(t (83) = 4.86, p<.00\). The students who would like to attend a doctoral program perceive the instrumental value of science more positively \(\bar{x} = 60.73\) than the students who would not like to apply for a doctoral program \(\bar{x} = 55.00\).
Table 4. Residential area and “difficulty and complexities of science”

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
<th>p</th>
<th>Significant Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>51.189</td>
<td>25.594</td>
<td>3.253</td>
<td>.044</td>
<td>Town-Metropolitan city</td>
</tr>
<tr>
<td>Within</td>
<td>645.117</td>
<td>7.867</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4 indicated the participants’ residential area and difference about the views on difficulty and complexities of science \([F (2–82) = 3.25, p<.05]\). The results show that there is a significant difference on difficulty and complexities of science according to the residential area of the participants. The Scheffe test results showed the difference is between the people lived in the town and the metropolitan city. The perception on the difficulty and the complexities of science are higher among the participants living in city \((\bar{X} = 19.93)\) and town \((\bar{X} = 22.00)\) compared to the people living in the metropolitan city \((\bar{X} = 19.00)\). The students lived in a town believe that science is a difficult and complex subject to learn.

This result is consistent with the study made by George (2000). In his longitudinal study George (2000) measured change in students’ attitude toward science. He found that the students in the metropolitan city and the ones in the rural areas schools have less positive attitudes toward science.

In conclusion, the attitudes of the teachers toward science are important. For this reason, teachers should gain positive attitudes toward science in their training process. The attitudes of the teacher candidates toward science were the scope of this study. It is found that the attitudes of the teacher candidates toward science significantly differ especially in terms of instrumental value of science and difficulty and complexities of science. The departmental differences seem to be one of the important factors influencing differences in attitude toward science. Also, attitudes toward science differ according to the place people lived most of their life time -town, city or the metropolitan city-. Finally the students differ in their science perception according to whether they would like to apply for a doctoral program or not.

Although result indicated no any significant difference in science perception according to gender, education level of the family, academic and intellectual self concept; it does not mean that these factors are not totally unrelated with attitude toward science. This type of descriptive studies should be conducted on large sample of teacher candidates.

Scientific thinking and positive attitude toward science gain more importance in the world where the fundamentalism, conservatism and ethno-centrism increased. Schools are very important places to teach scientific thinking abilities and to disseminate universal values as humanism, secularism and human rights. Teachers, who have a crucial role in the formal education process, should gain scientific thinking abilities and positive attitudes toward science in their training process.

4. Reference


Kağıtçıbaşı, Ç.(1996). İnsan ve insanlar. İstanbul: Evrim Yayınları


