Do Religious Values of Prospective Teachers Affect Their Attitudes Toward Science Teaching?

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ABSTRACT

This study aimed to examine the associations between prospective science teachers' values (theoretical, religious, economic, aesthetic, social and political values) and their attitudes towards science teaching. Cross-sectional research design was used. Science Teaching Attitude Scale-II and Allport-Vernon-Lindzey Values Test were used for assessing prospective science teachers' attitudes toward science teaching and their values respectively. As a result of list-wise deletion, the sample appeared to be 281 prospective science teachers. Regression analysis showed that religious value of prospective science teachers was a significant predictor of their attitudes toward science teaching ($F_{(1, 279)} = 14.787$, $p<.01$). In order to neutralize the possible negative impacts of religious values, it is suggested that science teachers must be aware that religion and science are two different ways of knowing. In this respect, the present study implies the importance of explicitly discussing different ways of knowing in science teacher training programmes.

Keywords: Prospective Science Teachers; Attitudes toward Science Teaching; Values.

INTRODUCTION

Science teachers' attitudes toward science teaching have a crucial role in science education. Teachers' like or dislike of science affects students' attitudes toward science, and therefore, teachers with a negative attitude toward science are more likely to produce students that do not like science (Shrigley, 1974). Moreover, teachers' attitudes toward science teaching are likely to affect their teaching competency (Thamilmani, 2000) thereby influencing their students' attitudes toward science.

According to the theory of reasoned action, 'attitudes follow reasonably from the beliefs people hold about the object of attitude' (Ajzen & Fishbein, 1975; 1980 as cited in Ajzen, 1988, p.32). Consistently with this theory, it is argued that teachers' beliefs greatly influence their attitudes (Atwater, Gardner, & Kight, 1991). Allchin (1999) also states that 'science teachers who understand the multi-faceted relationship between science and

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values can guide students more effectively in fully appreciating the nature of science (p.1).

Values, on the other hand, are defined as abstract ideas that represent beliefs about ideal modes of conduct and ideal terminal goals (Rokeach, 1968, as cited in Gari, Mylonas, & Karagianni, 2005). Based on Spranger's (1928, as cited in Allport, Vernon & Lindzey, 1960a) classification of values, Allport, Vernon & Lindzey (1960b) attempted to measure the relative prominence of value types. In other words, they (1960a) suggested that each person consists of a value combination of six value types, which include "Theoretical", "Economic", "Aesthetic", "Social", "Political" and "Religious" values. Theoretical value refers to the interest in discovery of truth. Economic value is related to practical matters and usefulness. Aesthetic value refers to the interest in form and harmony. Social value refers to the altruistic and philanthropic aspect of love of people. Political value is related to the interest in power and religious value refers to comprehending universe in its unity (Allport, Vernon & Lindzey, 1960a).

Within this framework it is possible to argue that values in general might have a role in forming ideal modes about their attitudes toward their profession. Moreover, one of the value types, which specifically might be in interaction with learning and teaching science, is the religious one. In a study, Sinclair and Pendarvis (1997) aimed to assess college students' understanding and acceptance of scientific evidence supporting evolutionary theory. They found that most students did not understand the primary tenets of evolutionary biology while some of them felt that 'evolutionary theory and their religious beliefs were at odds' (p.167). This finding implies that there is an interaction between religious beliefs and learning or teaching science. In support of this view, Dickerson, Dawkins & Penick (2008) emphasize that "many make knowledge claims based upon a religious faith and these knowledge claims can impact the teaching and learning of science" (p.360). In this respect, there is an ongoing debate in order to overcome any negative interaction between knowledge claims based on religious beliefs and teaching science. On the one hand, some argue that science and religion are incompatible and therefore "religious education is an obstacle to the development of scientific mentality" (Mahner & Bunge, 1996:101) On the other hand, some argue that "there are constructive tensions rather than incompatibilities between science and religion" (Lacey, 1996:143). Therefore, "a dialogue-based alternative is proposed, whereby representatives of religious, spiritual and non-spiritual positions are invited to present and defend their views in honest discussions" (Wren-Lewis, 1996:185). In addition, Roth & Alexander (1997) states that although science and religion are incommensurable at the institutional level, a potential interference of religious values with learning science at the individual level has been understudied. The present study attempts to fill the gap in this understudied area by revealing associations between prospective science teachers' religious values and their attitudes toward science teaching at the individual level.

In a study with 1040 preservice elementary science teachers, Cobern and Loving (2006) assessed students' valuation of science vis-a-vis culturally important categories such as epistemology, economy, religion, aesthetics etc. As a result of this study, Cobern and Loving (2006) suggested that 'science interest might be improved by more contextual teaching approaches that seek to develop the valuation of science within a cultural context' (p.2).

Within this framework, the present study hypotheses that prospective science teacher values including "Theoretical", "Economic", "Aesthetic", "Social", "Political" and "Religious" values are associated with their attitudes toward science teaching. Moreover, science teachers' attitudes toward science teaching refer to hypothetical constructs that represent science teachers' like or dislike for science teaching. In this respect, science teachers can hold positive, negative or neutral attitudes towards science teaching, which

are highly likely to be effective on their science teaching practice and students' learning science. The present study tries to find out the relationships between prospective science teachers' values and their attitudes toward science teaching.

The purpose of the present study is twofold. First, it aims to find out the significant predictors of prospective science teachers' attitudes towards science teaching with respect to various values they hold. With this aim the relationships between prospective science teachers' values and their attitudes toward science teaching is examined in general. Second, any potential interaction between prospective teachers' religious values and their attitudes toward teaching science is examined in particular.

METHODOLOGY

Cross-sectional research design was used. Cross-sectional research design is a quantitative method and makes use of objective measuring techniques and statistical analysis in order to explain the associations between variables. In this type of research design, variables are determined for correlation analysis but they are not controlled unlike in the experimental design (Ary, Jacobs, & Razavieh, 2002).

1) Sample

Data were collected from 337 prospective science teachers in two state universities in Istanbul. All students were requested to complete 2 instruments, namely Science Teaching Attitudes Scale (STAS-II) and Allport Vernon Lindzey Values Test (SOV) As a result of list-wise deletion, the sample appeared to include 281 prospective science teachers. List wise deletion was implemented for the students who did not complete both instruments. The characteristics of the sample can be seen in Table 1.

Table 1. *The Sample Characteristics*

	4th year		3rd year		Total
	Male	**Female**	**Male**	**Female**	
University A	43	54	47	49	193
University B	15	23	15	35	88
Total		135		146	**281**

2) Instruments

The adapted versions of STAS-II and SOV were used for assessing prospective science teachers' attitudes toward science teaching and their values respectively.

a) STAS-II: The test consists of 60 likert-type statements related to science and teaching science. The statements include 30 positive and 30 negative statements toward science and science teaching and are assigned to 8 sub-scales. This test was widely used in international researches and translated into several languages including Thai, Hebrew and Spanish (Moore & Foy, 1997). Turkmen (1999) adapted this test into Turkish. The reliability of this Turkish form of the test was found to be 0.80 with the test-retest method (Turkmen & Bonnstetter, 1999). Three of the subscales measure the attitudes toward science teaching with 30 items. These subscales consist of items related to positive and negative attitudes toward science teaching, teaching processes or facts in science class and role of teacher as facilitator or transferring knowledge. The sum of the scores of these three dimensions represents teachers' attitudes toward science teaching.

b) SOV: In the study of values test Allport, Vernon and Lindzey (1960b) attempted to measure the relative prominence value types. They (1960a) suggested that each person

consists of a value combination of six value types, which include 'Theoretical', 'Economic', 'Aesthetic', 'Social', 'Political' and 'Religious' values. Around these six basic value types the instrument uses a 'forced-choice method'. That is to say, given two or more alternatives the individual is forced to select preferences by assigning scores to them. Then, these scores are totalled according to the instructions and final score points out the relative importance of the six values in the individual's life. This test was cited in numerous studies in various fields including psychology, medicine, education etc. (Silberman, 1976, Gari, Mylonas, & Karagianni, 2005). The reliability of the test computed by Cronbach Alpha estimates was found to be 0.90. This test was adapted into Turkish by Cansever, Gürkaynak and Ogun (in Mugaloglu, 2006) and previous researchers used this adapted version (Ardac, Albayrak-Kaymak, & Erktin, 1994).

3) Procedure

The instruments were applied during one of the required courses for prospective science teachers. Before application, permissions were taken from the class instructors. The participants were given information about the purpose of the study and instructions that they had to follow while completing the instruments.

4) Data Analysis

After data collection, the variables were defined for relational analysis. The variables and their definitions were summarized in Table 2. The data were examined with correlation and stepwise regression analysis.

Table 2. *Definitions and Types of Variables*

Variable	Definition
Attitudes towards Science Teaching	Total points taken from the related 3rd subscale of "*STAS*-II"
Theoric values	Total points taken from the "Theoric values" subscale of SOV
Social Values	Total points taken from the "Social values" subscale of SOV
Political Values:	Total points taken from the "Political values" subscale of SOV
Economic Values	Total points taken from the "Economic values" subscale of SOV
Aesthetic Values	Total points taken from the "Aesthetic values" subscale of SOV
Religious Values:	Total points taken from the "Religious values" subscale of SOV

FINDINGS

The result of correlation analysis in Table 3 showed that prospective science teachers' political, social, economic and aesthetic values were not significantly correlated with their attitudes toward science teaching at $p<.01$ level. On the other hand, prospective science teachers' theoretical values were positively associated with their attitudes toward science teaching ($r= 0.155$, $p<.01$). Moreover, prospective science teachers' religious values were negatively correlated with their attitudes toward science teaching ($r=-0.224$, $p<.01$).

Table 3. *Correlations*

		Theoretical Value	Economic Value	Aesthetic Value	Social Value	Political Value	Religious Value
Attitudes Toward Science Teaching	Pearson Correlation	.155[*]	-.061	.145	.101	.062	-.224[*]
	Sig. (2-tailed)	.009	.309	.015	.092	.301	.000
	N	281	281	281	281	281	281

*. Correlation is significant at the 0.01 level

In addition, the following regression equation was tested in order to specify the significant predictors of prospective science teachers' attitudes toward science teaching.

Attitudes toward science teaching = constant + a (theoretical values) + b (economic values) + c (aesthetic values) + d (social values) + e (political values) + f (religious values)

Table 4. *Regression Coefficients*

Variables	B	Standard error β	Standardized β	T	p
Constant	104. 69	5.12		56.687	0.00
Religious Value	-0.16	0.09	-0.224	-3.845	0.00

R= 0.224 R^2 =0.05
F=14.787   **p<0.01**

The result of regression analysis (Table 4) indicated that religious value of prospective science teachers was a significant predictor of their attitudes toward science teaching ($F_{(1, 279)}$ = 14.787, p<.01). As a result, the final linear equation was found to be:

Attitudes toward Science Teaching = 104. 69 - 0.16 (Religious Value)

CONCLUSION AND DISCUSSION

It can be concluded that there is a weak positive association between prospective science teachers' theoretical values and their attitudes toward science teaching. However, regression analysis reveals that theoretical value is not a significant predictor of attitudes toward science teaching. As for significant predictors of prospective science teachers, it is found that religious value of prospective science teachers is a significant predictor, which may negatively affect prospective science teachers' attitudes toward science teaching. So, this study quantifies a potential interference of prospective science teachers' religious values with their attitudes toward science teaching.

In the literature, Mansour (2008) concluded that "teachers' religious beliefs were among the major constructs that drive teachers' ways of thinking and classroom practices about scientific issues related to religion" (p.557). For example, in a study Cobern (2000) found that most of the teachers spoke about the aesthetics aspects and religious ideas associated with nature and some teachers "affirm, in relatively strong terms, a connection or association between religion and nature" (p.82). Moreover, Mansour (2008) highlighted "the powerful influence of teachers' religious beliefs in dealing with or gaining new knowledge" (p.557). So, religious beliefs are closely related to the ways of thinking and practices of the teachers. By quantifying the negative association between prospective science teachers' religious values and their attitudes toward science teaching, the present study may contribute to the ongoing debates about whether theistic worldviews of teachers threaten their understanding of science concepts as well as how a potential negative interference of these theistic views with learning and teaching science is overcome

(Martin-Hansen, 2006).

One way of overcoming any potential interference of science teachers' religious values with science teaching could be ensuring coexistence of science and religion as two distinct ways of knowing. On the one hand, science asks questions about the physical world around us and comes to conclusions through observation, experiment and reasoning. On the other hand, religion asks questions about supernatural world and comes to conclusions through revelation, practice, and faith. In this sense, science and religion ask different questions and use different methodologies to make sense of the physical and supernatural world, and therefore, they are not opposing ways of knowing (Zimmerman, 2006). Not fully appreciating these distinctions between religion and science may result in interference of personal religious values of science teachers on their attitudes toward science teaching. So, it is suggested that science teachers must be aware that religion and science are two different ways of knowing, and therefore, their attitudes toward science teaching and science practices in classes have to be unrelated to their religious beliefs.

Researchers indicated that students who consider science and religion as opposing ways of knowing did not show improvement on their nature of science views (Abd-el-Khalick & Akerson, 2004; Roth & Alexander, 1997). As Abd-el-Khalick and Akerson (2004, p.803) stated "the interaction between students' religious views and learning about nature of science was not limited to controversial and sensitive issues, such as evolutionary theory".

In another study, Brickhouse, Dagher, Letts and Shipman (2000) recommended inclusion of treatment of science and religion in college-level science courses so as to prevent comparison of scientific explanations and religious views. They also stated 'this should not be treated as an unqualified recommendation, for the religious beliefs of some instructors or their institutional settings might well preclude an effective intervention' (p.354). Briefly, it might be crucial to discuss the incommensurable nature of scientific and religious discourse in science teacher training programmes. In this respect, the present study suggests explicitly discussing the different ways of knowing in order to neutralize the possible negative impacts of religious values of science teachers on their attitudes toward science teaching. Yet, the findings of this study need to be supported by further studies, as this analysis is limited with the instruments used and the prospective science teachers in Turkey.

ACKNOWLEDGEMENT

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