Examining the Relationships among Acceptance of Evolution, Religiosity, and Teaching Preference for Evolution in Turkish Preservice Biology Teachers

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**INTRODUCTION**

Treating evolution as a unifying theme in biology education has been endorsed by major science education policy documents and understanding of evolution has been considered as an important part of scientific literacy in the United States (American Association for the Advancement of Science [AAAS] 1993; National Research Council [NRC] 1996, 2011). Major science education organizations such as the National Association of Biology Teachers (2002) and the National Science Teachers Association (2003) in the United States have also endorsed evolution as a unifying theme in biology.

While biologists and educators may agree on evolution's unifying role, public attitudes and standard curriculum sometimes appear less certain.

Miller and others (2006) compared the acceptance of evolutionary theory among adults in the US with the acceptance of evolutionary theory among adults in Japan and 32 European countries. United States ranked 33rd, just before Turkey among 34 countries. In Iceland, Denmark, Sweden, France, Japan, and the United Kingdom, 75% or more adults accepted evolutionary theory. In the US and Turkey, acceptance rates were about 40% and 25% respectively.

The situation in the US is well studied. What many find surprising is the high percentage of teachers who do not accept evolutionary theory. For example, Berkman and others (2008) compared acceptance of evolutionary theory among a national sample of 939 biology teachers with acceptance of evolutionary theory among a representative sample of the general public in the United States. They found that 28% of biology teachers and 13% of the general public endorsed the view that “Human beings have developed over millions of years but God had no part in this process”; 47% of biology teachers and 30% of the general public agreed that “Human beings have developed over millions of years but God guided this process”; 16% of biology teachers and 48% of the general public agreed that “God created human beings pretty much in their present form at one time within the last 10 000 years or so”; and 9% of both biology teachers and the general public did not offer any opinion. These findings show that 75% of US biology teachers and 43% of the general public accept evolutionary theory with or without the guidance of God.
Miller and others (2006) indicated that Turkey ranked at the bottom of the list among 32 European countries with about 25% acceptance rate. Turkey is the only Muslim country among these 32 European countries, and this raises the question of how religious orientation affects the acceptance of evolutionary theory among Turkish biology teachers. For example, researchers reported a negative relationship between religious orientation and acceptance of evolutionary theory. Grose and Simpson (1982) found that students in an introductory college biology class who perceived that their churches generally influenced their thoughts had lower acceptance of evolutionary theory. Osif (1997) reported that the importance of religion in biology teachers’ lives is positively correlated with biblical literalism including the rejection of the evolutionary theory.

It is reasonable to expect that biology teachers’ acceptance of evolutionary theory will influence how they treat evolution in their own classes. Biology teachers who accept evolutionary theory are more likely to use evolution as an overarching theme in their teaching. In fact, a significant number of studies indicated that acceptance of evolutionary theory is a good predictor of instructional approach taken toward evolution (Aguillard 1999; Eve and Dunn 1990; Rutledge and Mitchell 2002; Shankar and Skoog 1993). For this reason, biology teachers’ religious orientation and acceptance of evolutionary theory can be a very significant factor that influences to what extent students will be exposed to evolutionary theory in biology courses.

The situation in Turkey adds another variable. To date, there is little research examining the relationships among acceptance of evolutionary theory, religiosity, and teaching preference for evolution in Muslim countries. This study will explore the relationships among Turkish preservice biology teachers’ acceptance of evolutionary theory, religiosity, and their preference for teaching evolution.

**Methodology**

**Participants**

Our sample consisted of 147 Turkish preservice secondary biology teachers from a university in Western Turkey. The school of education in which our participants were enrolled was among the top five schools of education in the country. The educational levels represented were: 39 first-year students (26.5%), 30 second-year students (20.4%), 32 third-year students (21.8%), 20 fourth-year students (13.6%), and 26 fifth-year students (17.7%). Preservice biology teachers who participated in this study attend the same biology education program for five years. All preservice biology teachers in the program take the same courses. Courses offered during the first four years are primarily science content courses. Pedagogy, biology teaching methods, and measurement and evaluation courses were offered during the second half of the fourth year and during the fifth year. Traditional lectures coupled with traditional lab classes are used as the primary method of instruction in almost all biology courses offered in the program. All participants take an evolution course during their seventh semester.

**Context of the Study**

Turkey’s population is approximately 70 million. Turkey is a predominantly Muslim country embracing parliamentary secular democracy. The Turkish education system is historically modeled after Western education principles during the late Ottoman era, and espe-
cially after the declaration of the Republic of Turkey in 1923. The government controls the curriculum and instruction in elementary and secondary schools throughout the country through a centralized education system. In Turkey, compulsory education is eight years.

The evolution and creationism issue stirs a lot of public controversy in Turkey (Sayin and Kence 1999). An influential creationist foundation, Bilim Arastirma Vakfi (BAV; the Science Research Foundation), published several anti-evolutionary books such as *The Evolution Deceit* and held numerous conferences throughout the country. BAV also has ties with the Institute for Creation Research (Edis 1999). Although Turkish and American creationists agree in rejection of evolution as a scientifically valid theory there are striking differences between the Christian and Muslim accounts of creation. For instance, the Qur'an is not explicit about how creation happened, and the concept of time is relative in the Qur'an, meaning that a day should not be interpreted literally as 24 hours.

**Measures**

Survey instruments measuring the acceptance of evolutionary theory and preferences for teaching evolution were translated into Turkish by the first author. Translations were reviewed by a panel of experts including a biology professor and a science education professor for accuracy and consistency before the study was conducted. They were both fluent in Turkish and English.

*Acceptance Measure.* Acceptance of evolutionary theory among preservice biology teachers was measured by the measure of acceptance of the theory of evolution (MATE) developed by Rutledge and Warden (1999). This measure originally consists of 20 items, each to be rated by the participant on a 1 (strongly disagree) to 5 (strongly agree) Likert scale. This 1–5 Likert scale allows participants to remain undecided on a particular question (3 = undecided). A score of 20 meant a flat rejection of evolutionary theory and a score of 100 meant the highest degree of endorsement for acceptance of evolutionary theory. Content validity of this instrument was reported by Rutledge and Warden (1999).

*Religious orientation question.* All of our participants were Muslim. Participants’ religiosity was measured by a single self-report question. The religious orientation score represents to what extent participants feel religious and to what extent religion plays an important role in their lives.

Participants’ religiosity was measured by the following question:

Which of the statements below best represents your religious position?
   a. I am not religious at all; 1 point
   b. I am somewhat religious; 2 points
   c. Religion is an important part of my life; 3 points
   d. Religion is a very important part of my life; 4 points

*Preference for teaching evolution.* Preference for teaching evolution was determined by the following question.

Which of the following statements about teaching evolution would you support?
   a. Creationism and evolution should always be taught side by side in the same class in schools.
b. Only creationism should be taught in schools, not evolution.
c. Only evolution should be taught in schools, not creationism.
d. Creationism and evolution should both be taught in school, but need not be taught in the same class.
e. Neither creationism nor evolution should be taught in schools.

Data Analysis

For some items in MATE (“positive” items), strong agreement indicates high acceptance of evolution; in others (“negative” items), strong agreement indicates rejection of evolution. We converted the scores from negatively worded MATE items’ scores so that a high score indicated acceptance and a low score indicated rejection. This made the results easier to analyze by standard statistical approaches. Mean, standard deviation, and minimum and maximum values for the MATE instrument and religiosity question were calculated. The reliability coefficient (Cronbach’s alpha) for the MATE and intercorrelations between acceptance of evolutionary theory and religiosity were also calculated.

Data analysis and production of figures showing the relationships among acceptance of evolutionary theory, religiosity, and teaching preference for evolution were performed by using Statistical Package for the Social Sciences (SPSS 17.0).

Results

Mean, standard deviation, minimum, and maximum values for the MATE instrument and religiosity question were presented in Table 1. Overall, participants were undecided in terms of their acceptance or rejection of evolutionary theory. Their mean acceptance of evolution score was 65.52. A score of 20 on the acceptance of evolution instrument indicates that a particular person completely rejects evolution as a scientifically valid theory, a score of 60 indicates that this particular person is undecided, and a score of 100 indicates that this particular person fully accepts evolution as a scientifically valid theory. Only 4.1% of our participants reported that they are not religious, but more than 60% of our participants reported that they are either religious or very religious. Thirty-three percent of our participants described themselves as somewhat religious.

| Table 1. Means, standard deviations, maximum and minimum scores of surveys’ responses. |
|---------------------------------|---------|---------|-------|-------|
| Acceptance of Evolution (MATE)  | Mean    | SD      | Max.  | Min.  |
|                                 | 65.52   | 14.49   | 96    | 28    |
| Religiosity                     | 2.75    | .77     | 4     | 1     |

We found a significant negative correlation between acceptance of evolutionary theory and religiosity ($r = -.57, \rho < .01$; Figure 1). This means that participants with a strong religious orientation are less likely to accept evolutionary theory compared to participants with a weak religious orientation or no religious orientation at all.

Participants who agreed that only evolution should be taught in schools, not creationism, constituted 9.5% of all participants (Figure 2). They had higher acceptance of evolutionary theory scores compared to participants who marked the rest of the other choices in the
Participants who endorsed the view that only creationism should be taught in schools constituted only 3.4% of all participants. They had the lowest acceptance of evolutionary theory scores. Participants endorsing that creationism and evolution should always be taught side by side in the same class in schools (27.9%) and participants endorsing that creationism and evolution should both be taught in school, but need not be taught in the same class (55.8%) had comparable scores for acceptance of evolutionary theory.

Whether it is in the same class or not, more than 83% of all participants agreed that both evolution and creationism should be taught in schools. Participants who stated that neither creationism nor evolution should be taught in school constituted only 3.4% of all participants. Their acceptance scores were lower than participants who endorsed the view that only creationism should be taught in schools, not evolution, but their acceptance scores were lower than rest of the other participants.

Participants who endorsed the view that only creationism should be taught in schools, not evolution (3.4%) had the maximum religious orientation score of 4 points (Figure 3). For these participants, religion was a very important part of their lives. Participants who endorsed the view that only evolution should be taught in schools, not creationism (9.5%) had the lowest religious orientation scores (average 1.64). Participants who endorsed the view...
that creationism and evolution should both be taught in school, but need not be taught in the same class (55.8%), and participants who endorsed the view that creationism and evolution should always be taught side by side in the same class in schools (27.3%), were similar in terms of their religious orientation scores (average 2.84 points and average 2.78 points respectively). Overall, these participants were close to being religious. Participants who stated that neither creationism nor evolution should be taught in school (3.4%) were religious (average 3 points). These participants had the second highest religious orientation score, after participants who stated that only creationism should be taught in schools, not evolution (3.4%).

**Discussion**

It is clear that among these participants, preservice biology teachers' preference for teaching evolution is related to their acceptance of evolutionary theory and religious orientation. The correlations in this study suggest that the strong religious orientation of some preservice biology teachers in Turkey may lead them not to accept evolutionary theory, and this can, in turn, influence their teaching preference for evolution.

Our results are parallel to the findings of others who also found that biology teachers with strong religious orientation are less likely to accept evolution as a scientifically valid theory.
Our results are also parallel to the findings of those who found that acceptance of evolutionary theory is a good predictor of instructional approach taken toward evolution (Aguillard 1999; Eve and Dunn 1990; Rutledge and Mitchell 2002; Shankar and Skoog 1993).

In this study, participants' religious orientation was measured with a single self-reported item that may not capture the full complexity of the religiosity of respondents. Therefore, to explore the relationship between religiosity and both acceptance and teaching of evolution, there is a need to develop a valid and reliable religiosity scale that can be used in the context of exploring attitudes to evolution.

One important question is whether the main problem in acceptance of evolution is due to a prior religious commitment or to a poor understanding of modern science. If the latter is a significant issue, then helping biology teachers improve their nature of science (NOS) views might ease the tension between religious orientation and acceptance of evolutionary theory. NOS refers to values and beliefs specific to scientific knowledge and its development (Lederman 1992; Lederman 2007).

It is known that formal NOS instruction that explicitly addresses issues related to characteristics of scientific knowledge and how scientific knowledge is constructed by scientists is effective in improving science teachers’ understandings of NOS (Lederman 2007).
Sophisticated NOS understandings might help biology teachers not to view science and religion in opposition. This realization may help biology teachers not to reject evolution on religious grounds.

**References**


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