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The Teacher Candidates' Attitudes Towards Teaching of Evolution Theory

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Abstract: The aim of this study is to evaluate of primary class and science teacher candidates' attitudes towards teaching of evolution theory. A total of 236 students, 120 primary class teacher candidates and 116 primary science teacher candidates, volunteered to participate in the research. The data for the research were collected with a data-collection tool that included two parts as "Personal Information form" and "Teaching Evolution Theory Attitude Questionnaire (TETAQ)". In the analysis of the data, a multivariate analysis (MANOVA) for more than two group comparisons were used. In this study result; The teacher candidates' negative attitudes for lack proof evolution due to the teaching of evolution theory mean scores of teacher candidates were higher than the teacher candidates' positive attitudes towards need to the teaching of evolution theory. According to this finding, It can be said that the teacher candidates are negative generally the attitudes towards teaching of evolution theory.

Key words: attitude, teacher candidates, teaching of evolution, science.

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Özet- Bu çalışmanın temel amacı ilköğretim sınıf ve fen bilgisi öğretmen adaylarının evrim teorisi öğretimine yönelik tutumlarını değerlendirmektir. Bu araştırma 120 ilköğretim sınıf öğretmenliği, 116 ilköğretim fen bilgisi öğretmen adayları olmak üzere toplam 236 öğretmen adayı ile gerçekleştirilmiştir. Araştırmada verileri toplamak için kişisel bilgi formu ve Yetişir ve Kahyaoğlu (2010) tarafından geliştirilen "Evrim teorisi öğretimine yönelik tutum ölçeği" kullanılmıştır. Verilerin analizinde Çoklu Varyans Analizi (MANOVA) testinden yararlanılmıştır. Çalışma sonunda; öğretmen adaylarının kanıt yetersizliğinden dolayı evrim teorisi öğretilmemesi gerektiğine yönelik olumsuz tutumların evrim teorisi öğretilmesine yönelik olumlu tutumlarda daha yüksek olduğu tespit edilmiştir. Elde edilen bulgulara göre öğretmen adaylarının evrim teorisi öğretimine yönelik tutumlarının genelde düşük olduğu söylenebilir.

Anahtar kelimeler: tutum, biyoloji, evrim teorisi, öğretmen adayları

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Introduction

Evolution theory is one of the most significant issues of living science. Evolution theory concerns with changes in living things during the history of life on earth. Evolution theory says that all living things are related to one another through common ancestry from earlier forms that differed from the present forms and biological evolution, lasting many millions of years, has occurred on earth. The origins and evidence for the theory that today's living organisms are the result of a long period of biological evolution (Downie, 2004). Evolution theory is one of the well-supported and scientifically strong bodies of knowledge which explains many aspects of life on earth. Dobzhansky (1973) stated that the evolution theory generates base of modern science while Gould (1982) said that like biology teaching, having no evolution theory, to chemical having no periodic table. Bishop and Anderson (1990) affirmed that it is not possible to comprehend biology without perceiving evolution theory. According to Ertan (2007) evolution is not an incident which occurred and ended in history but it is a fact that shape whole universe, world, nature and life. It is a concept harmonizing, uniting of numerous knowledge obtained from science of nature. In respect of this view, evolution acts as a roof which keeps biological knowledge in united form. Evolutionary theory is central to and a unifying theme of the discipline of biology. The evolution theory not only has a broad explanatory power, but also inspires fruitful research programs in biology as well as several other scientific disciplines. National Academy of Science (NAS) (1998) stated that the importance of the theory of evolution is grounded in its function and power in explaining the similarities among living things, the diversity of life, and many features of the physical world we inhabit. Explanation of these phenomena in terms of evolution draws upon physics, chemistry, geology, many areas of biology and other sciences. A great number of questions, without mentioning the evolution, can be answered with knowledge of various scopes, such as physics, chemistry, geology, genetics, physiology, cytology, anatomy, and molecular biology. However the universal approach is a necessity to answer qualitative questions about how incidents take place. To teach biology without explaining evolution deprives students of a powerful concept that bring order and coherence to the understanding of life. Nevertheless, students seem to have some difficulties in perceiving evolution theory, learning and in accepting evolution theory as a theory of biology (Bishop & Anderson 1990; Settlage 1994; Sinclair & Baldwin 1997; NAS, 1998).

Clough (1994) indicated that students who are denied an introduction to biological evolution not only receive a false impression of modern science, but also miss one of the most

comprehensive frameworks ever conceived by human intellect. Evolution provides a basic understanding of the fundamental characteristics of life at all levels. Thus, students cannot adequately understand the relationships of organisms to each other and to their environment without substantial knowledge of evolutionary theory and population dynamics (Cherif, Adams & Loehr, 2001). Scientific understanding of evolution theory is complex and multifaceted; therefore it is not surprising that people may hold incomplete knowledge or misconceptions about the process (Miller; 1999). College students generally fail to comprehend or have poor understanding regarding the theory of evolution (Bishop & Anderson, 1990). The studies have revealed that students have poor understanding regarding to the theory of evolution, it is because students have some deficiencies to comprehend the difference between scientific and non-scientific knowledge, content knowledge of theory besides concepts such as theory, law, and hypothesis, linked to the nature of science (Baker & Piburn 1997; Lawson 1995).

Research has shown that, many teachers avoid teaching about evolution because they know relatively little about the subject. Other teachers avoid teaching about evolution because they are creationists who believe that God created the universe including humans and other living things-all at once in the relatively recent past or are afraid of reprisals from powerful parents or administrators (Moore, 2002). Studies by Bakanay and İrez (2009) over theory of evolution indicated that candidate teachers of biology have negative attitudes towards the theory of evolution. Deniz et al. (2008) found that there was a significant correlation between participant's knowledge about evolution and their acceptance of the theory of evolution. In a similar vein Apaydın and Sürmeli (2009) stated that acceptance of candidate teachers regarding the theory of evolution is low. In a study conducted by Rutledge and Warden (2000), biology teachers were surveyed to determine their degree of acceptance of key aspects of evolutionary theory, and factors correlating to their acceptance or non-acceptance. This study showed that there is a significant correlation between the non-acceptance of evolutionary theory, misunderstanding of evolutionary theory, and basic misunderstanding of the nature of science itself. In similar to Alters and Nelson (2002) pointed out that prior conceptions related to evolution, scientific epistemology, view of the biological world, religious orientation often support students' misunderstanding of the evolutionary concepts. They also emphasized that some of these supporting misconceptions may be fundamental to learning evolutionary concepts.

Teaching the theory of evolution is very crucially important for biology and science education. However research studies related to teaching of evolution theory are limited in Turkey. We wished to fill the gap in the literature regarding teacher candidates' comport with teaching of evolution theory. The aim of this study is to evaluate of primary class and primary science teacher candidates' attitudes towards teaching of evolution theory.

This study attempted to answer the following questions:

1. What are the teacher candidates' attitudes regarding teaching the theory of evolution?
2. How do levels of the teacher candidates' attitudes regarding teaching the theory of evolution differ based on the teacher candidates' gender and programs?

Methodology

Sample

This research was conducted at a state university in Turkey during the 2009-2010 academic year. A total of 236 students, 120 primary class teacher students and 116 primary science teacher students, volunteered to participate in the research. The sample was made up of 59,2% male, 40,8 % female.

Table-1. Teacher candidates' personal characteristics

Gender	**F**	**%**
Male	138	58,5
Female	98	41,5
Program		
Primary Class Teaching	120	51,3
Primary Science Teaching	116	48,7

Data Gathering Tools

The data for the research were collected with a data-collection tool that included two parts as "Personal Information form" and "Teaching Evolution Theory Altitude Questionnaire (TETAQ)". In the first part of the instrument, "Personal Information Form", there were some questions about the primary teacher candidates' program and gender. *Teaching of Evolution Theory Attitudes Questionnaire (TETAQ)*: In this study used the TETAQ developed by Yetişir and Kahyaoğlu (2010) in order to determine teacher candidates' attitudes towards teaching of evolution theory. TETAQ which was prepared by Yetişir and Kahyaoğlu (2010) and which originally consisted of 26 questions and three sub-scales. This study was used two sub-scales

and a total of 19 items. The sub-scales of the inventory were the 11 item sub-scale of positive attitudes towards need to the teaching of evolution theory and the 8 item sub scale of negative attitudes for lack proof evolution due to teaching of evolution theory. The scale was rated as "Completely agree (5)", "Agree (4)", "Undecided (3)", "Disagree (2)", and "Completely Disagree (1)". The reliability coefficients of TETAQ were found ,85 for sub-scale of positive attitudes towards need to the teaching of evolution theory, .93 for sub-scale of negative attitudes for lack proof evolution due to teaching of evolution theory.

Data Analysis

In the analysis of the data, besides descriptive statistical techniques such as means and standard deviations, parametric statistical techniques such as a multivariate analysis (MANOVA) for more than two group comparisons were used. SPSS 16.0 was used for the statistical data analysis, a significant level of , 05 was adopted at the level of significance.

Results

The results of the means and standard deviations on the teacher candidates' positive attitudes towards need to the teaching of evolution theory and the teacher candidates' negative attitudes for lack proof evolution due to the teaching of evolution theory are shown in table1.

Table-1. Means, standard deviations and variance in attitudes toward teaching evolution theory

	N	Mean	SD	Variance
The teacher candidates' positive attitudes towards need to the teaching of evolution theory	236	3.06	1.01	1.02
The teacher candidates' negative attitudes towards lack proof evolution due to teaching of evolution theory	236	3.53	0.74	0.55

When the results in table-1 are examined, it is seen that the teacher candidates' negative attitudes for lack proof evolution due to the teaching of evolution theory mean scores are higher than the teacher candidates' positive attitudes towards need to the teaching of evolution theory. According to this results, It can be said that the teacher candidates' attitudes towards teaching of evolution theory generally is negative. A multivariate analysis of variance was conducted to determine if programs and gender variables had a no significant difference with the teacher candidates' positive attitudes towards need to the teaching of evolution theory and the teacher candidates' negative attitudes for lack proof evolution due to teaching of evolution theory. The means and standard deviations for the teacher candidates' positive attitudes towards need to the teaching of evolution theory and the teacher candidates' negative attitudes

for lack proof evolution due to the teaching of evolution theory are shown in Table-2. Equality of covariance was acceptable based on Box's M (Box's M:17.211; F= .933, p>0.05).

Table-2. Means and standard deviations for the teacher candidates' attitudes towards the teaching of evolution theory related to program and gender

Variables	Program	Gender	Mean	Std. Deviation	N
The positive attitudes towards need to the teaching of evolution theory	Primary Class Teacher	Male	3.07	1.11	76
		Female	2.88	1.09	45
		Total	3.00	1.10	121
	Primary Science Teacher	Male	3.02	.90	62
		Female	3.27	.90	53
		Total	3.13	.91	115
	Total	Male	3.04	1.02	138
		Female	3.09	1.00	98
		Total	3.06	1.01	236
The negative attitudes for lack proof evolution due to teaching of evolution theory	Primary Class Teacher	Male	3.62	.74	76
		Female	3.56	.76	45
		Total	3.60	.74	121
	Primary Science Teacher	Male	3.61	.74	62
		Female	3.26	.69	53
		Total	3.45	.74	115
	Total	Male	3.62	.74	138
		Female	3.40	.73	98
		Total	3.53	.74	236

According to result in table-2, the primary science teacher female candidates had the highest mean scores on the positive attitudes towards need to the teaching of evolution theory (M=3.27). The primary classroom teacher female candidates had the lowest mean score on the positive attitudes towards need to the teaching of evolution theory (M=2.88). The total mean scores of the male teacher candidates' the positive attitudes towards need to the teaching of evolution theory (M=3.04) were lower than the female teacher candidates (M=3.09). The total mean score of the primary science teaching teacher candidates' positive attitudes towards need to the teaching of evolution theory (M=3.13) were higher than the primary class teacher candidates (M=3.00). Among teacher candidates, the primary class teacher male candidates had the highest mean scores on the negative attitudes for lack proof evolution due to the teaching of evolution theory (M=3.62) while the primary science teacher female candidates had the lowest mean score on the negative attitudes for lack proof evolution due to the teaching of evolution theory (M=3.26). The total mean score of the male teacher candidates' negative attitudes for lack proof evolution due to the teaching of evolution theory itself

(M=3. 62) were lower than the female teacher candidates (M=3.40). The total mean score of the primary classroom teacher candidates' negative attitudes for lack proof evolution due to the teaching of evolution theory (M=3. 60) were higher than the primary science teacher candidates (M=3.45). The results of the MANOVA are given in Table-3.

Table-3. The result of the multivariate analysis of variance for the teacher candidates' attitudes towards the teaching of evolution theory related to program and gender

Source	Dependent variables	df	F	p	n^2
Programs	The positive attitudes towards need to the teaching of evolution theory	1	1.616	.205	1.655
	The negative attitudes for luck proof evolution due to teaching of evolution theory	1	2.619	.107	1.426
Gender	The positive attitudes towards need to the teaching of evolution theory	1	.055	.815	.056
	The negative attitudes for lack proof evolution due to teaching of evolution theory	1	4.491	.055	2.445
Programs* Gender	The positive attitudes towards need to the teaching of evolution theory	1	2.666	.104	2.732
	The negative attitudes for lack proof evolution due to teaching of evolution theory	1	2.086	.150	1.136

A multivariate analysis of variance was conducted to assess whether there were differences between the teacher candidates' positive attitudes towards need to the teaching of evolution theory and the teacher candidates' negative attitudes for lack proof evolution due to the teaching of evolution theory in related to programs and gender. The analysis indicated that there no was significant difference between the teacher candidates' positive attitudes towards need to the teaching of evolution theory ($F_{(1,778)}$=1.616; p>0.05) and the teacher candidates' negative attitudes for lack proof evolution due to teaching of evolution theory ($F_{(1,778)}$=2.619; p>0.05) based on programs (Wilk's Lambda=.977; $F_{(1,778)}$=.152; p>0.05). Gender was another variable that was significantly related to the dependent variables. The teacher candidates' positive attitudes towards need to the teaching of evolution theory were no differentiated based on gender ($F_{(1,778)}$= .055; p>0.05) and the teacher candidates' negative attitudes for lack proof evolution due to teaching of evolution theory were found significant difference ($F_{(1,778)}$=4.491; p>0.05) based on gender (Wilk's Lambda=.977, $F_{(1,778)}$=.060; p>0.05).

Other results indicated that the interaction between programs and gender were not significant (Wilk's Lambda=.977, F(1.778)=,152 p>0.05). Based on this interaction effect,

there is a not significant difference between the teacher candidates' positive attitudes towards need to the teaching of evolution theory (F(.055)= 2.666; p>0.05) and the teacher candidates' negative attitudes for lack proof evolution due to teaching of evolution theory (F(.055)=2.086; p>0.05).

Discussion and Recommendations

The results of this study indicated that the teacher candidates' negative attitudes for lack proof evolution due to teaching of evolution theory mean scores are higher than the teacher candidates' positive attitudes towards need to the teaching of evolution theory. According to this results, It can be said that the teacher candidates' negative and low generally attitudes towards teaching of evolution theory. These results are supported by other studies (Miller et.al 2006; Deniz et al., 2008; Aydın & Sürmeli, 2009; Bakanay & İrez, 2009; Köse, 2010). Çetinkaya (2006) reported a low level of acceptance towards teaching of evolution theory because science education is poor in Turkey. Türkmen et.al (2008) investigated Turkish preservice elementary teachers' ideas on the theory of evolution after they have completed a science education methodology course in a college of education at a university in western Turkey. By asking the participants about their ideas regarding the theory of evolution explicitly with an open ended question. The majority of the preservice teachers indicated that they do not accept the theory of evolution as scientifically valid. Among the reasons they provided the most common was that the theory of evolution was not proved and it was rejected. Findley et.al (2001) stated that good teaching involves the identification and removal of barriers to learning. In the case of evolution, one of the major barriers to learning appears to be the relationship between evolutionary theory and religion. Ayala (2000) stated that the theory of evolution must be taught in schools, because nothing in biology makes sense without it. In the research determined that the primary science teaching teacher candidates' positive attitudes towards need to the teaching of evolution theory itself were higher than the primary class teaching teacher candidates. Besides the female teacher candidates' positive attitudes towards need to the teaching of evolution theory itself were higher than the male teaching teacher candidates. In this study it was found that there is not a significant difference either the teacher candidates' positive attitudes towards need to the teaching of evolution theory itself or the teacher candidates' negative attitudes for lack proof evolution due to the teaching of evolution theory based on gender and program. According to Woods and Scharrmann (2001), if teachers are to be successful in teaching of evolution theory, they must take into account our students' worldviews as well as their individual understandings and

misconceptions. It is important to know their students' cultures, personal histories, cognitive abilities, religious beliefs, and scientific misconceptions. It is also important to address directly the likely cultural/religious concerns with evolution and to do so early on so as to break down the barriers that keep many students from hearing what you say (Woods & Scharrmann, 2001). One goal of any science and class teacher should be to attempt to infuse, into existing backgrounds, an understanding of and openness to consider evolutionary theory. According to Sinatra et al. (2003) strong religious beliefs have a negative effect on developing positive views on the content of teaching evolutionary theory. On the other hand, Deniz et al. (2008) suggest that the more educated a person is, the more he/she are willing to accept evolutionary theory as an ideal in science education.

In conclusion, it was found that the attitudes towards teaching of evolution theory among teacher candidates is generally low and negative. With this result in mind, this study suggests the following in order to raise teacher candidates' attitudes towards teaching of evolution theory:

1) In teaching about evolutionary theory, critical thinking, the nature of science and the history of science should be considered.

2) Beside the theoretical aspect of teaching evolution theory, field trips and basic scientific processes and software programs enriched with animations should be utilized in science education programs

3) Any misconceptions, if any, coming from teacher candidates about teaching evolution theory should be identified and cleared with proper teaching methods and techniques.

4) When teaching environmental education courses, not just theoretical information related to environment but also the concept of biodiversity and its relationship to the evolution should also be covered.

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Öğretmen Adaylarının Evrim Teorisi Öğretimine Yönelik Tutumları

Özet

Evrim teorisi canlılar biliminin en tartışmalı ve karmaşık konularından biridir. Bu nedenle canlılar biliminin en önemli teorilerinden biridir. Kence (2007)'e göre bilim insanları bir teoriyi mutlak doğru olduğu için değil, söz konusu olay yada olaylara o gün için en iyi açıklama gücüne sahip olduğu için kabul edildiğini belirtmektedir. Rudolph ve Steward (1998)'e göre evrim teorisi çok farklı disiplinlerden gelen, çok farklı kanıtları kullanıp günümüzde yaşamakta olan canlılar arasındaki benzerlikleri ve farklılık ilişkisini en iyi açıklayan bilimsel açıklama olduğunu belirtmiştir (akt:Bakanay, 2008). Dobzhansky (1973)'e göre evrim teorisi modern biyolojinin temelini oluşturmaktadır. Gould (1982)'e göre evrim teorisi olmayan bir biyoloji eğitiminin periyodik cetvel olmayan kimya öğretimine benzetmektedir. Bishop ve Anderson (1990) evrim teorisi anlaşılmadan modern biyolojinin anlaşılamayacağını belirtmiştir (akt: Apaydın ve ark., 2007). Evrim teorisinin öğretimi fen ve biyoloji eğitimi için oldukça önemlidir. Bununla birlikte literatürlerde evrim teorisi ile ilgili bir çok çalışma bulunurken evrim teorisi öğretimiyle ilgili sınırlı sayıda çalışma bulunmaktadır. Bu çalışmanın amacı ilköğretim sınıf ve fen bilgisi öğretmen adaylarının evrim teorisi öğretimine yönelik tutumlarını belirlemektir. Bu genel amaçla aşağıdaki sorulara cevap aranmamıştır.

1- Öğretmen adaylarının evrim teorisi öğretimine yönelik tutumları nasıldır?
2- Öğretmen adaylarının evrim teorisi öğretimine yönelik tutumları cinsiyet ve öğrenim gördüğü program değişkenlerine göre nasıl bir farklılık göstermektedir?

Araştırma Türkiye'de bir üniversitede, 2009-2010 eğitim ve öğretim yılında öğrenim gören öğretmen adayları ile gerçekleştirilmiştir. Araştırmaya ilköğretim sınıf öğretmenliği programında öğrenim gören 120 ve fen bilgisi öğretmenliği programında öğrenim gören 116 olmak üzere toplam 236 öğretmen adayı ile gerçekleştirilmiştir. Araştırmaya katılan öğrencilerin 98'i kız, 138'i erkek öğrenciler oluşturmaktadır. Araştırmada veri toplama araç olarak Yetişir ve Kahyaoğlu (2010) tarafından geliştirilen "*Evrim teorisi öğretimine yönelik tutum ölçeği"* ile toplanılmıştır. Ölçek beşli likert tipinde olup evrim teorisi öğretiminin gerekliliğine yönelik olumlu tutum ve kanıt yetersizliğinden dolayı evrim teorisi öğretimine yönelik olumsuz tutum alt boyutları olmak üzere toplam 19 maddeden oluşmaktadır. Verilerin

analizinde Çoklu Varyans Analizi (MANOVA) kullanılmıştır. İstatistiksel işlemler SPSS 16.0 paket programı aracılığıyla yapılmıştır.

Öğretmen adaylarının evrim teorisi öğretimine yönelik tutumları incelendiğinde, öğretmen adaylarının evrim teorisi öğretiminin kanıt yetersizliğinden dolayı öğretilmemesine yönelik olumsuz tutum puanı ortalamaları (3.53) evrim teorisi öğretiminin gerekliliğine yönelik olumlu tutum puanı ortalamasından (3.06) daha yüksek olduğu tespit edilmiştir. Buna göre öğretmen adaylarının evrim teorisi öğretimine yönelik tutumların düşük olduğu söylenebilir. Öğretmen adaylarının öğrenim gördüğü programlara göre evrim teorisi öğretiminin gerekliliğine yönelik olumlu tutumları ($F_{(1,778)}$=1.616; p>0.05) ve kanıt yetersizliğinden dolayı evrim teorisi öğretilmemesine yönelik olumsuz tutumları ($F_{(1,778)}$=2.619; p>0.05) toplam puanlarının farklılaşmadığı (Wilk's Lambda=.977; $F_{(1,778)}$=.152; p>0.05) tespit edilmiştir. Ortalamalarına bakıldığında, fen bilgisi öğretmenliği programında öğrenim gören öğretmen adaylarının evrim teorisi öğretiminin gerekliliğine yönelik olumlu tutumlarının sınıf öğretmenliği programında öğrenim gören öğretmen adaylardan daha yüksek olduğu tespit edilmiştir. Bununla birlikte ilköğretim sınıf öğretmenliği programında öğrenim gören öğretmen adaylarının kanıt yetersizliğinden dolayı evrim teorisi öğretilmemesine yönelik olumsuz tutumlarının fen bilgisi öğretmenli öğretmen adaylardan daha yüksek olduğu tespit edilmiştir. Öğretmen adaylarının cinsiyetlerine göre evrim teorisi öğretiminin gerekliliğine yönelik olumlu tutumları ($F_{(1,778)}$=.055; p>0.05) ve kanıt yetersizliğinden dolayı evrim teorisi öğretilmemesine yönelik olumsuz tutumları ($F_{(1,778)}$=4.491;p>0.05) toplam puanlarının farklılaşmadığı (Wilk's Lambda=.977, $F_{(1,778)}$=.060;p>0.05) tespit edilmiştir. Ortalamalarına incelendiğinde, kız öğretmen adaylarının evrim teorisi öğretiminin gerekliliğine yönelik olumlu tutumlarının erkekler öğretmen adaylardan daha yüksek olduğu bununla birlikte erkek öğretmen adaylarının kanıt yetersizliğinden dolayı evrim teorisi öğretilmemesine yönelik olumsuz tutumlarının kız öğretmen adaylardan daha yüksek olduğu tespit edilmiştir.

Bu çalışma sonucunda öğretmen adaylarının kanıt yetersizliğinden dolayı evrim teorisi öğretilmemesine yönelik olumsuz tutum puanı ortalamalarının evrim teorisi öğretilmesinin gerekliliğine yönelik olumlu tutum puanı ortalamalarından yüksek olduğu tespit edilmiştir. Buna göre öğretmen adaylarının evrim teorisi öğretimine yönelik tutumlarının düşük olduğu söylenebilir. Yapılan benzer çalışmada Bakanay (2008) Biyoloji öğretmen adaylarının önemli bir kısmının evrim teorisine karşı olumsuz bir tutum içinde olduğunu belirtmiştir. Çetinkaya (2006) Türkiye'de öğrencilerin evrim teorisi öğretimini kabul etmeye yönelik tutumların

düşük olduğunu belirtmiştir. Yaptığımız çalışmada öğretmen adaylarının cinsiyet ve program değişkenlerine göre evrim teorisi öğretiminin gerekliliğine yönelik olumlu tutum ve kanıt yetersizliğinden dolayı evrim teorisi öğretilmemesine yönelik olumsuz tutumları arasında anlamalı bir farklılaşma olmadığı tespit edilmiştir. Bilindiği gibi eğitimin temel amacı toplumun gelişimine katkıda bulunabilecek bireyler yetiştirmektir. Bu amaçla öğrencilerde bilimsel düşünce becerilerini geliştirmek oldukça önemlidir. Bununla birlikte bilimin doğasını anlamada evrim teorisinin öğretimi oldukça önemlidir. Bu araştırma sonucunda öğretmen adaylarının evrim teorisinin öğretimine yönelik tutumlarının artırılması için aşağıdakiler önerilmektedir. Buna göre; bilimin doğası ve tarihinde, eleştirel düşünmede evrim teorisinin öğretilmesinin önemi vurgulanmalı, fen eğitiminde evrim teorisinin teorik öğretimin yanında arazi gezileri, temel bilimsel yöntemler ve animasyonlarla zenginleştirilmiş yazılım programlar kullanılmalı, öğretmen adayların evrim teorisi öğretimiyle ilgili kavram yanılgıları uygun öğretim yöntem ve teknikleri ile açıklanmalı, çevre eğitimi öğretimi ile ilgili derslerde sadece çevreyle ilgili teorik bilgiler aktarılmamalı aynı zamanda biyolojik çeşitlilik ve evrim ilişki konuları kapsamalı.