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INVESTIGATION OF SCIENCE AND TECHNOLOGY TEACHERS AND PRE-SERVICE TEACHERS' OPINIONS ABOUT CONSTRUCTIVIST APPROACH

(FEN VE TEKNOLOJİ ÖĞRETMENLERİ VE ÖĞRETMEN ADAYLARININ YAPILANDIRMACI YAKLAŞIMA YÖNELİK GÖRÜŞLERİNİN İNCELENMESİ)

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ABSTRACT

The purpose of the present study is to determine the science and technology teachers and pre-service teachers' opinions about constructivist approach and investigate these opinions according to some variables. Employing the survey method, the present study used a scale to elicit the opinions about constructivist approach. The sampling of the study consists of 31 science and technology teachers working in different cities of Turkey and 58 fourth-year science and technology pre-service teachers attending Science and Technology teaching department of the education faculty at Çanakkale Onsekiz Mart University. The analyses conducted revealed that the opinions of the science and technology teachers about constructivist approach are more positive than the opinions of science and technology pre-service teachers. Moreover, it was found that the opinions of the science and technology teachers and pre-service teachers about constructivist approach do not significantly vary depending on age and gender.

Keywords: Constructivist approach, science and technology teachers, pre-service teachers, opinion.

ÖZ

Bu çalışmanın amacı fen ve teknoloji öğretmenleri ve öğretmen adaylarının yapılandırmacı yaklaşıma yönelik görüşlerini belirlemek ve farklı değişkenlere göre incelemektir. Tarama yönteminin kullanıldığı çalışmada yapılandırmacı yaklaşıma yönelik görüş ölçeği kullanılmıştır. Çalışmanın örneklemini Türkiye'nin farklı illerinde ve bölgelerinde görev yapan 31 Fen ve Teknoloji öğretmeni ile Çanakkale Onsekiz Mart Üniversitesi Eğitim Fakültesi Fen ve Teknoloji öğretmenliği 4. sınıfta öğrenim göre 58 öğretmen adayı oluşturmaktadır. Yapılan analizler sonucunda; Fen ve teknoloji öğretmenlerinin yapılandırmacı yaklaşıma yönelik görüşleri fen ve teknoloji öğretmen adaylarına göre daha olumlu olduğu, Fen ve teknoloji öğretmenleri ve öğretmen adaylarının yapılandırmacı yaklaşıma yönelik görüşleri yaşlarına ve cinsiyetlerine göre değişmediği ortaya çıkmıştır.

Anahtar sözcükler: Yapılandırmacı yaklaşım, fen ve teknoloji öğretmenleri, öğretmen adayları, görü

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INTRODUCTION

Having qualified citizens is one of the issues great importance is attached to by societies. This is only possible through education and instruction. It is impossible not to see the effects of innovations and technological advancements on human life in today's world. So far, much research has been carried out in the field of education in relation to learning and this research has been conducted in learning settings where different approaches have been adopted (Balım et al., 2009; Tatlı and Ayas, 2012). With the transition from industrialization era to information era, there have been many changes occurring in scientific knowledge and technology and all these changes have found reflections in our daily lives as well as in our education system. The existing teacher-centered traditional education conception consisting of unquestionable truths was replaced by constructivist conception of education accompanied by postmodern approach to education where information is not objective and which is more student-centered as a result of changing scientific facts and developing technology (Akpınar and Aydın, 2007).

In the old traditional conception of education, information was accumulated under the roof of unchanging knowledge paradigm in which even mentioning the changeability of knowledge was unthinkable. The existing information used to be transferred from person to person and no new information could be added. For students, knowledge was certain and unchangeable. Yet, with developing science and technology, some changes were observed in the paradigm. Old knowledge was replaced by new knowledge and more sophisticated knowledge was built on the existing knowledge. Information is not directly transferred any more. First, individuals have a cognitive structure based on their prior experiences. And they build up their new information on this cognitive structure (Bağcı Kılıç, 2001; Nikitina, 2010, Fox and Snape, 2011; Chan, 2010; Ültanır, 2012). Building up new information on prior information is called constructivism. With this new construction, the individual generates new attitudes towards new situations. The most important characteristic of this constructivist approach is providing individuals with the opportunities to construct, interpret and evaluate information. Receiving information and constructing it do not mean the same thing. The learner first compares the new information received with the prior information and if there is some conflict to be experienced, he/she creates new

rules (Hartfield, 2010; Gültepe, Yıldırım and Sinan, 2008; Şeyihoğlu and Kartal, 2010; Dhindsa and Emran, 2011; Fox and Snape, 2011; Chan, 2010; Ültanır, 2012). This cognitive structure is created in three ways. These are *cognitive constructivism*, *social constructivism* and *radical constructivism* (Bağcı Kılıç, 2001; Dougiamas, 1998).

This new approach directs students to activities throughout the process such as research-questioning, finding ways to solution, relating scientific facts to daily life and thus, makes students active participants of the process. During the process, within the role of a guide, what is expected from the teacher is to help students to obtain information by having access to the sources of information, acquire problem solving skills and scientific viewpoints by following the innovations in the field of education (Balım et al., 2009; Martin, Jean-Sigur and Schmidt, 2005; Doğru and Kalender, 2007; Nikitina, 2010; Hartfield,2010; Fox and Snape, 2011; Ravenscroft, 2011; Ültanır, 2012).

Activities designed in line with constructivist approach have an important role in making students acquire scientific process skills and science and technology literate in science education (Bahar, 2003; Hartfield,2010; Nikitina, 2010, Tatlı and Ayas, 2012). Throughout the process of constructivist approach, as students become active during the process and gain experiences by doing and living, the retention of the information obtained in this process can be longer-lasting and the students may get rid of their misconceptions coming from their former education (Bahar, 2003).

Due to its characteristics such as making students active and employing alternative assessment and evaluation techniques, constructivist approach has been adopted as the basis of elementary, secondary and high school teaching programs. Hence, when the science and technology program is evaluated, it is seen that it is also built on constructivist approach. Teacher training institutions should assume an important role to introduce constructivist approach to their students and enable them to use this approach when they become a teacher. Throughout their undergraduate education, pre-service teachers need to learn that they should follow the innovations, alternative assessment and evaluation techniques, how to integrate these techniques and innovations into the process and how to make students active in class etc. (Doğru and Kalender, 2007; Nikitina, 2010; Nikitina, 2010; Ravenscroft, 2011). During the learning process, one of the important characteristics of the student having an important influence on the process is students' attitudes towards the subject (Altınok, 2004).

When the literature is reviewed, it is seen that there is much research on constructivist approach. Balım et al., (2009) carried out a study to develop "Constructivist Approach Opinion Questionnaire". In this study, they administered their questionnaire to pre-service teachers (n=465) from ten universities then they conducted validity and reliability works of the questionnaire and for the content validity of the questionnaire, expert opinions were sought, item analysis and factor analysis were conducted. Çakıcı (2010) tried to explain the origins and causes of pre-service teachers' misconceptions about constructivist approach and presented the samples of such misconceptions from various studies and in the last section of the study, discussions on the use of constructivist approach in science classes are given. Balım et al., (2009) investigated the opinions of pre-service science teachers (n=107) in relation to some independent variables such as gender, age, grade level and the type of high school graduated. Çınar, Teyfur and Teyfur (2006) investigated the opinions of elementary school teachers and directors (n=195) about constructivist approach and program by using "Constructivist Approach Evaluation Questionnaire". As a result, they reported that in general the teachers and directors have positive opinions about constructivist approach and think that the most important obstacle in front of constructivist approach is the lack of infrastructure at schools.

The purpose of the present study is to determine the opinions of pre-service science and technology teachers about constructivist approach and investigate them in relation to different variables.

METHOD

Research model

The present study is a survey. Karasar (2010) defines the survey as a means of revealing past or present state of a phenomenon; Büyüköztürk, Çakmak, Akgün, Karadeniz and Demirel (2009) define it as a study aiming to determine participants' opinions, interests, skills, attitudes et. in relation to a situation or event.

Universe and sampling

The universe of the study consists of science and technology teachers working in Turkey and science and technology pre-service teachers from the education faculty of Çanakkale Onsekiz Mart University. The sampling of the

study, on the other hand, consists of 31 science and technology teachers working in different cities of Turkey and 58 fourth-year pre-service science and technology teachers attending Science and Technology teacher education department of Çanakkale Onsekiz Mart University education faculty.

Table 1. Descriptive Data for the Sample of the Study

	n	**%**
Teacher	31	34,8
Pre-service teacher	58	65,2
Female	62	69,7
Male	27	30,3
Total	89	100

31 teachers and 58 pre-service teachers participated in the study. 69.7% of the participants are female and 30.3% are male.

Data collection instruments

The present study employs "Constructivist Approach Opinion Questionnaire" developed by Balım, Kesercioğlu, İnel and Evrekli (2009) with a reliability coefficient of a= 0.97 to determine the science and technology teachers and pre-service teachers' opinions about constructivist approach. The questionnaire consists of 30 5-point Likert type items. The responses to these items can be given as "Strongly disagree", "Disagree", "Undecided", "Agree" and "Strongly agree".

Data analysis

The collected data were analyzed through SPSS 20.0 program package. Frequencies and percentages were used to show the distribution of the teachers and pre-service teachers according to age and gender. The data were evaluated by using independent-samples t-test and one-way ANOVA. Content analysis was also used in the evaluation of the data.

FINDINGS AND DISCUSSIONS

3.1. Comparison of the science and technology teachers' opinions with the pre-service teachers' opinions about constructivist approach

Table 1: T-Test Results Concerning the Science and Technology Teachers and Pre-Service Teachers' Opinions about Constructivist Approach

	Group	**n**	$\overline{X}$	**S**	**sd**	**t**	**p**
Constructivist approach	Teacher	31	126.09	16.52	87	1.00	.001*
	Pre-service teacher	58	123.13	11.20			

p<.05*

As can be seen in Table 1, independent samples t-test was used to determine whether there is a significant difference between the scores taken by the science and technology teachers and the scores taken by the pre-service teachers from the questionnaire.

T-test results show that there is a significant difference between the scores taken by the science and technology teachers and the scores taken by the pre-service teachers from the questionnaire ($t(87)=1.00$, $p<.05$). It is seen that the science and technology teachers' opinions about constructivist approach ($\overline{X}$ =126.09) are more positive than the opinions of the pre-service teachers ($\overline{X}$ =123.13).

3.2. Comparison of the science and technology teachers and pre-service teachers' opinions about constructivist approach in terms of gender.

Table 2. Findings Concerning the Teachers and Pre-Service Teachers' Opinions about Constructivist Approach in Relation to Gender

	Gender	**n**	$\overline{X}$	**S**	**sd**	**t**	**p**
Constructivist approach	Female	62	122.85	13.17	87	-1.42	.15
	Male	27	127.18	13.27			

p>.05

As can be seen in Table 2, t-test was conducted to see whether there is a significant gender-based difference between the scores taken from the questionnaire aiming to elicit the opinions of the science and technology teachers and pre-service teachers.

The results of the t-test revealed that the science and technology teachers and pre-service teachers' opinions about constructivist approach do

not vary significantly depending on gender (t(87)=-1.42, p>.05). Hence, it can be argued that gender does not have a significant influence on the teachers and pre-service teachers' opinions about constructivist approach.

3.3. Comparison of the science and technology teachers and pre-service teachers' opinions about constructivist approach according to their age group

Table 3. Descriptive Data Concerning the Science and Technology Teachers and Pre-Service Teachers' Opinions about Constructivist Approach in Relation to Age Variable

	Age group	**n**	$\overline{X}$	**S**
Constructivist Approach	18-23	52	122.94	11.31
	24-29	24	126.62	16.06
	30+	13	124.53	15.39
	Total	89	124.16	13.28

When we look at Table 3, we can see that the highest number of teachers and pre-service teachers is in the age group of 18-23 (n=52), and the lowest number of teachers and pre-service teachers is in the age group of 30 and older (n=13). The highest mean score was obtained for the opinions of the teachers and pre-service teachers in the age group of 24-29 ($\overline{X}$ =175.71).

Table 4. ANOVA results concerning the teachers and pre-service teachers' opinions about constructivist approach in relation to age group

		Sum of Squares	Sd	Mean of Squares	F	p	Significant difference
Constructivist approach	GA	224.78	2	112.39	.63	.53	
	Gİ	15305.68	86	177.97			
	General	15530.47	88				

p>.05

One-way variance analysis was conducted to see whether there is a significant difference among the teachers and pre-service teachers' scores taken from the scale of opinions about constructivist approach based on age group.

There is no significant difference among the scores taken from the scale of opinions about constructivist approach by the teachers and pre-service teachers based on age group [$F_{(2-86)}$=.63, p>.05]. In light of this finding, it can be argued that teachers and pre-services teachers' opinions about constructivist approach do not significantly vary depending on their age.

RESULTS, DISCUSSION AND SUGGESTIONS

The purpose of the present study is to compare the opinions of science and technology teachers and pre-service teachers about constructivist approach and investigate these opinions in relation to some variables. The study carried out for this purpose has revealed the following results:

- ✓ The science and technology teachers' opinions about constructivist approach are more positive than the opinions of pre-service science and technology teachers. This may be because of the fact that while the pre-service teachers are mostly dealing with the theoretical aspects of constructivist approach, the teachers are mostly engaged in its practical aspects.
- ✓ Opinions of the science and technology teachers and pre-service teachers do not significantly vary depending on gender. This result concurs with the findings reported by Balım et al. (2009) who carried out a study with science and technology pre-service teachers. Balım et al. (2009) also reported that the opinions of the pre-service teachers do not significantly vary depending on gender. However, İnel, Türkmen and Evrekli (2010) investigated the opinions of classroom pre-service teachers about constructivist approach in relation to gender variable and found that the opinions of female are more positive than the opinions of males.
- ✓ The reason why the opinions of the teachers and pre-service teachers do not significantly vary depending on gender may be the equality of opportunity ensured in education. The teachers and pre-service teachers regardless of their gender have education and carry out their educational activities under the same conditions. Hence, this result may have been obtained.
- ✓ The opinions of the science and technology teachers and pre-service teachers do not significantly vary depending on their age. This is parallel to the finding of Balım et al. (2009), who carried out research on science and technology pre-service teachers. Balım et al. (2009)

concluded that the opinions of the pre-service teachers do not significant vary depending on their age. This finding can be interpreted as the teachers and pre-service teachers conceptualize constructivist approach in the same way regardless of their age.

In light of these findings, following suggestions can be made;

- ✓ Pre-service teachers should be provided with the opportunities of practicing constructivist approach during their undergraduate education.
- ✓ Teachers and pre-service teachers should be encouraged to participate in activities oriented to constructivist approach.
- ✓ The opinions of teachers and pre-service teachers should be investigated through observations and interviews.

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