Turkish Science Teachers' Attitudes towards the Constructivist Approach

Ayşem Seda Önen [1], Canan Altundağ [2], F. Merve Mustafaoğlu [3]

[1] Department of Secondary Science and Mathematics Education, Hacettepe University, Ankara, TURKEY

[2] Department of Secondary Science and Mathematics Education, Hacettepe University, Ankara, TURKEY

[2] fmerveulusoy@gmail.com

Department of Secondary Science and Mathematics Education, Hacettepe University, Ankara, TURKEY
Correspondence author: F. Merve Mustafaoğlu
Hacettepe University/ Faculty of Education
Chemistry Teaching Department
06800 Beytepe/ Ankara TURKEY
Phone: +90 312 297 67 83
Fax: +90 312 297 86 00

ABSTRACT

In this study, the attitudes of physics, chemistry and biology teachers towards constructivist approach were investigated in terms of participants' demographic information (e.g. subject area, professional seniority, education, participation to in-service training or not…). In total, 1958 teachers, who are working at high schools of Turkish Ministry of National Education in different cities, from all aforementioned subject areas participated in the study. The constructivist approach questionnaire used in the study was developed by Balım, Kesercioğlu, İnel and Evrekli (2002). Aforementioned questionnaire is designed in 5-point Likert type and consists of 20 items, which are divided into three factors. The Cronbach-Alpha reliability of sub-factors of the questionnaire is 0.93, 0.91 and 0.90 respectively. Demographic information used in the study was formed by the participants. The results of the study revealed that there is a positive correlation between the attitudes of the teachers towards constructivist approach and their demographic information, and the findings have been reported.

Keywords: *Constructivism; Attitude; Science Teachers*

INTRODUCTION

Primary issues emerging from the traditional instructional practices are that the taught knowledge is not permanent, that it is memorized as a preparation for exams and not remembered afterwards, that a vast majority of the knowledge are learnt incompletely or misunderstood by the students, and that students fail to use the attained knowledge and skills effectively in their future lives. These issues, which are the results of traditional instruction, lead educators to probe on developing more effective, productive and attractive instructional practices. Traditional instruction practices are principally based on the objectivist approach. Constructivism has the capability to address a majority of the problems experienced in traditional instruction practices.

According to constructivism, learning is an internal process that occurs in an individual's mind. The individual is the active creator and assimilator of his/her behaviors rather than being a passive receptor of the external stimuli. Knowledge is not stored in the human mind as in the way it was carried into. Human mind is not an empty storage where all the information is stored. Constructivist theory is based on the hypothesis that all learning occurs as a result of the structuring process in the mind. According to this hypothesis, individuals construct the elements to be learned through establishing relations with the previously learned ones in their minds. During the construction process, individuals try to establish meanings using the knowledge in their minds and try to adopt the constructed meaning. In other words, individuals do not process learning in the way it is presented to them; however, they process it in the way they have constructed in their minds (Arslan, 2007; Glaserfeld, 1995). In the light of these, it can be claimed that the most important aspect of the constructivist education is that it enables learner to structure,

construct, interpret and develop the knowledge. Constructivist approach is closely related to constructing the knowledge and it aims to reflect on how learners locate and place the knowledge in their minds. As a philosophical trend, constructivism states that individuals themselves construct their own knowledge and world-view. The principles of constructivism with respect to the learning practices are based on the idea that "learning emerges from the attribution of meanings by the individuals" (Brooks & Brooks, 1999; Glasersfeld, 1998; Glatthorn, 1994; Hein, 1991; Piaget, 1973; Saban, 2002; Vygotsky, 1978; Wilson, 1996; Cited by Duman, 2007, p. 328-330). According to the philosophers of the constructivist approach, all individuals should not be assumed to observe the same objects in the same way (Öztürk, 2008).

Before Constructivism was applied in our education system, a teacher-centered approach used to be adopted at schools. In other words, the topic to be taught, the aims to be achieved at the end of the lesson, the method of teaching and the evaluation techniques used to be determined beforehand by the teachers. Teachers used to prepare lesson plans (daily plans), write all the steps to be followed during the lesson and teach the content verbally. In this way, all the decisions were taken by the teachers in this teacher-centered environment while students listened to and watched the presented content passively. The greatest challenge of this teaching method was that it eliminated the creativity, self-respect and sense of responsibility in the learner. The passive learner in this situation forgets what s/he has learnt in a short time. Many science educators and education researchers have suggested that constructivist theory is an important strategy and relevant authorities should be encouraged to apply it in teaching (Hançer & Yalçın, 2007; İngeç & Aytekin, 2010; Koray, Akyaz & Köksal, 2007; Önder & Beşoluk, 2010; Özsevgeç & Ürey, 2010; Özmen, 2003; Özmen & Yıldırım, 2005). In this respect, teachers have the most important role. In this study, it is aimed to analyze the attitudes of physics, chemistry and biology teachers towards the constructivist approach according to certain demographic variables. The current study investigates the demographic characteristics of science teachers working in Turkey in a detailed way. The aim was to examine the attitudes of science towards in Turkey toward the constructivist approach in terms of dynamic characteristics. However, many studies conducted in the field emphasize that dependent variables that are examined need to be addressed with regards to the demographic features (Buluş, Duru, Balkıs & Duru, 2011; Cengiz & Serbes, 2014; Kurtdede Fidan & Duman, 2014; Toker, 2007). Moreover, the correlations between the demographic characteristics of science teachers and their attitudes toward the constructivist approach have been studied. It has been speculated that demographic features such as gender have crucial effects on their attitudes regarding how the constructivist approach can create an effective teaching process in the long run.

METHODOLOGY

This study is based on the idea that the analysis of teachers' attitudes towards constructivism in terms of certain variables would contribute to increase the levels of achievement and satisfaction in their profession. Accordingly, it was believed that certain demographic characteristics of teachers would also contribute to the interpretation of this correlation, and surveys that reflected the opinions of teachers were used. In the quantitative dimension of the research, data were collected through Constructivist Approach Attitude Scale (Balım, Kesercioğlu, İnel & Evrekli, 2002). The opinions of teachers in the sampling were determined through the survey questions. Furthermore, statistical analysis were performed and interpreted with the aim of revealing demographic characteristics of teachers. It was identified whether the attitudes of teachers towards the constructivist approach varied in a statistically significant way in terms of their demographical characteristics such as subject area, professional seniority, education, participation to in-service training or not.

Sampling

Constructivist approach has been employed in the secondary education programs of Turkey since 2004. With this aim, the Ministry of Turkish Education prepared secondary education programs and introduced them (Boydak, 2008; MEB, 2005; Sünbül, 2007). These changes which were carried out without a serious preparation phase and procedures and gathering the opinions of teachers were not accepted as they were targeted. Therefore, some important problems showed up. While many teachers could not adapt

themselves to what the new approach brought, some others decided to retire at their most experienced and effective age. Moreover, many teachers followed their traditional ways of teaching despite the new program and the new approach. These program changes on the paper were difficult to put into practice as they were not accepted both in the heart and the mind. In this regard, the present study has been conducted with the aim to determine the phase of constructivist approach after nearly 10 years of its introduction in terms of science teachers. For this reason, it has been tried to clarify the issue with regard to significant demographic features (e.g. subject area, professional seniority, education, participation to in-service training or not…).

The universe of the study consisted of physics, chemistry and biology teachers teaching at secondary schools of the Ministry of National Education in various cities of Turkey. With the aim of limiting the universe for generalizing the results according to the purposes of the study, the purposive sampling method was applied. The sampling was composed of 1958 teachers teaching at the secondary schools of the Ministry of National Education in different cities of Turkey. The data was collected by the Ministry after the teachers granted their consents to take part in the present research.

Data Collection Tools

Constructivist approach attitude scale: Constructivist Approach Attitude Scale was developed by Balım, Kesercioğlu, İnel and Evrekli (2002) for science teachers. During the analysis of the data obtained, researchers observed that the scale could be developed in diverse factor structures; therefore, they proposed three different factor structures and tested through the confirmatory factor analysis. According to the confirmatory factor analysis results, it was determined that two- and three-factor models were more coherent with the data. In other words, the questionnaire could be used with one, two or three factors based on the aims of the researchers. The sub-factors of the questionnaire are named as “Positive attitudes towards Constructivist Approach”, “Negative attitudes towards Constructivist approach” and “Attitudes towards self-improvement in Constructivism”. As a result of the validity and reliability studies performed by the researchers, the Cronbach Alpha values of the scale according to the one-, two- and three-factor structures were computed as 0,93, 0,91 and 0,90 respectively. The scale, which consisted of 20 items, was developed in Likert-type.

RESULTS

Results about the attitudes of science teachers towards the constructivist approach

In order to determine the attitudes of teachers towards the constructivist approach, Constructivist Approach Attitude Scale, developed by Balım, Kesercioğlu, İnel and Evrekli (2002) was administered to the teachers. The results were obtained from the evaluation of the scale with three factors as the interpretation of the analysis revealed the model with three factors was more appropriate to the purpose of the study. Firstly, the data obtained were analyzed through the Levene Test.

Table 1. The homogeneity test of the data obtained from the constructivist approach attitude scale according to the demographic characteristics

	Levene Statistics	sd1	sd2	p
Gender	4.857	1	1956	0.208
Field of study	2.017	2	1955	0.133
Experience	0.452	3	1954	0.716
Education	1.066	1	1956	0.302
Participation in in-service training	0.003	1	1956	0.958
Implementation of constructivist approach	0.390	1	1956	0.532
Perception of professional competence	1.960	1	1956	0.162

*p<0.05

As can be seen in the Table 1, the values indicate the homogeneity of the variances. Therefore, the administration of variance analysis and t-test for the data analysis was found statistically appropriate.

The relationship between the attitudes of teachers towards the constructivist approach and the gender variable

The results of the t-test analysis, which was performed in order to determine whether there were differences in the attitudes of teachers towards the constructivist approach according to their genders, was displayed in Table 2.

Table 2. The comparison of the attitude scores regarding the constructivist approach according to the gender variable

Constructivist Approach Attitude Scale	Gender	N	$\bar{X}$	SD	df	t	p
Positive Attitude	Female	954	3.98	0.580	1956	2.12	0.034*
	Male	1004	3.92	0.628			
Negative Attitude	Female	954	2.82	0.284	1956	-3.51	0.000*
	Male	1004	2.87	0.328			
Attitude Towards Self-Improvement	Female	954	3.69	0.408	1956	-0.37	0.970
	Male	1004	3.67	0.440			
General Attitude	Female	954	3.98	0.580	1956	1.01	0.310
	Male	1004	3.92	0.628			

*p<0.05

As indicated in Table 2, female teachers had more positive attitudes towards the constructivist approach than the male teachers, and the male teachers had higher negative attitude scores than female teachers. The most important statistical proof of this finding was the significant difference at the p=0.05 level in the positive attitude and negative attitude sub-dimensions of the scale according to the gender variable.

The relationship between the attitudes of science teachers towards the constructivist approach and their education levels

The relationship between the attitude scores of participant teachers in terms of their education levels was evaluated according to the t-test analysis results and the findings were displayed in Table 3.

Table 3. The comparison of the attitude scores regarding the constructivist approach according to the gender variable

Constructivist Approach Attitude Scale	Educational background	N	$\bar{X}$	SD	df	t	p
Positive Attitude	Undergraduate	1587	3.95	0.600	1956	0.506	0.613
	Graduate	371	3.93	0.631			
Negative Attitude	Undergraduate	1587	2.81	0.296	1956	2.41	0.016*
	Graduate	371	2.85	0.311			
Attitude Towards Self-Improvement	Undergraduate	1587	3.98	0.640	1956	-0.815	0.415
	Graduate	371	4.01	0.645			
General Attitude	Undergraduate	1587	3.68	0.421	1956	0.588	0.556
	Graduate	371	3.67	0.439			

*p<0.05

Table 3 shows the t-test results of the attitude scores of participant teachers in terms of their education levels. Teachers with undergraduate degrees were observed to have more positive attitudes towards the constructivist approach; however, it was reversed in the dimension of attitudes towards self-improvement, and teachers with graduate degrees obtained higher scores. Yet, the analysis indicated that the significant difference was only observed in the sub-dimension of negative attitudes towards constructivist approach, and this difference was in favor of teachers with graduate degrees. That is, teachers having graduate degrees have much more negative attitudes for the constructivist approach than other teachers.

The relationship between the attitudes of teachers towards the constructivist approach and in-service training

Table 4 displays the results of the analysis carried out to compare the participating teachers' attitudes towards constructivist approach according to their participation in at least 5-days in-service training activities in last 3 years.

Table 4. The comparison of the attitude scores regarding the constructivist approach according to the participation in in-service training programs

Constructivist Approach Attitude Scale	In-service training	N	$\bar{X}$	SD	df	t	p
Positive Attitude	Yes	927	3.97	0.610	1956	1.238	0.218
	No	1031	3.93	0.601			
Negative Attitude	Yes	927	2.82	0.313	1956	2.88	0.004*
	No	1031	2.86	0.303			
Attitude Towards Self-Improvement	Yes	927	4.01	0.626	1956	1.098	0.273
	No	1031	3.97	0.654			
General Attitude	Yes	927	3.69	0.427	1956	0.778	0.439
	No	1031	3.67	0.423			

*p<0.05

According to Table 4, the negative attitude average scores of teachers, who did not attend in-service training activities, were higher than the average scores of teachers who participated. These differences in values were also reflected on statistical differences [$t_{(1956)}$= 2.88; p<0.05]. In other words, teachers who did not attend in-service training activities had more negative attitudes towards constructivist approach than those who participated.

The relationship between the attitudes of teachers towards the constructivist approach and implementation of the constructivist approach

In this part of the study, t-test was administered in order to determine whether there was a significant difference in the attitude scores of teachers with respect to the implementation of the constructivist approach and the results were displayed in Table 5.

Table 5. The comparison of the attitude scores regarding the constructivist approach according to the implementation of constructivist approach

Constructivist Approach Attitude Scale	Implementation of Constructivist Approach	N	$\bar{X}$	SD	df	t	p
Positive Attitude	Yes	909	4.12	0.577	1956	12.5	0.000*
	Sometimes	1049	3.79	0.588			
Negative Attitude	Yes	909	2.82	0.315	1956	-2.99	0.003*
	Sometimes	1049	2.86	0.302			

Attitude Towards Self-Improvement	Yes	909	4.08	0.647	1956	5.78	0.000*
	Sometimes	1049	3.91	0.625			
General Attitude	Yes	909	3.79	0.416	1956	10.9	0.000*
	Sometimes	1049	3.58	0.409			

*p<0.05

According to Table 5, there were differences between the average scores of teachers who implemented the constructivist approach and those who sometimes implemented the approach. These differences were found to be statistically significant.

The relationship between the attitudes of teachers towards the constructivist approach and their professional competence

Table 6 displays the results of the t-test analysis, which was administered in order to evaluate the attitude scores of teachers who found themselves competent or partly competent in their professions.

Table 6. The comparison of the attitude scores towards constructivist approach according to the professional competence

Constructivist Approach Attitude Scale	Professional Competence	N	$\bar{X}$	SD	df	t	p
Positive Attitude	Yes	1589	3.98	0.598	1956	4.48	0.000*
	Partly	369	3.82	0.622			
Negative Attitude	Yes	1589	2.84	0.310	1956	-1.34	0.166
	Partly	369	2.86	0.302			
Attitude Towards Self-Improvement	Yes	1589	4.00	0.639	1956	1.23	0.217
	Partly	369	3.95	0.649			
General Attitude	Yes	1589	3.70	0.420	1956	3.62	0.001*
	Partly	369	3.61	0.437			

*p<0.05

Table 6 displays values and figures, which indicate that the attitude scores of teachers, who found themselves competent in their profession, had more positive attitudes than other teachers. In other words, teachers, who accept themselves as competent in their profession, had more positive attitudes towards the constructivist approach.

The relationship between the attitudes of teachers towards the constructivist approach and their fields of study

The mean and standard deviation scores regarding the attitudes of participating Physics, Chemistry and Biology teachers towards constructivist approach were displayed in Table 7.

Table 7. Average attitude scores and standard deviations regarding the constructivist approach according to their fields of study

Constructivist Approach Attitude Scale	Subject Field	N	$\bar{X}$	SD
Positive Attitude	Physics	709	3.88	0.644
	Chemistry	426	3.93	0.600
	Biology	823	4.01	0.568
	Total	1958	3.95	0.606
Negative Attitude	Physics	709	2.88	0.318
	Chemistry	426	2.86	0.302
	Biology	823	2.81	0.300
	Total	1958	2.84	0.308
Attitude Towards Self-Improvement	Physics	709	3.96	0.679
	Chemistry	426	3.95	0.613
	Biology	823	4.03	0.619
	Total	1958	3.99	0.641
General Attitude	Physics	709	3.65	0.450
	Chemistry	426	3.67	0.427
	Biology	823	3.71	0.398
	Total	1958	3.68	0.425

Data in Table 7 shows the mean attitude scores. Table 8 displays the data required in order to determine whether there was a significant difference in the attitude scores of physics, chemistry and biology teachers towards the constructivist approach.

Table 8. Attitudes of teachers towards constructivist approach according to the field of study variable: One-way ANOVA

	Source of variance	Sum of squares	df	Mean of squares	F	p
Positive attitude	Intergroup	6.204	2	3.102	8.509	0.000*
	Intragroup	712.694	1955	0.365		
	Total	718.898	1957			
Negative attitude	Intergroup	1.964	2	0.982	10.391	0.000*
	Intragroup	184.741	1955	0.094		
	Total	186.705	1957			
Attitude Towards Self-Improvement	Intergroup	2.637	2	1.319	3.212	0.040*
	Intragroup	802.474	1955	0.410		
	Total	805.111	1957			
General Attitude	Intergroup	1.722	2	0.861	4.781	0.000*
	Intragroup	351.987	1955	0.180		
	Total	353.708	1957			

*p<0.05

As displayed in Table 8, the one-way variance analysis over the attitudes of physics, chemistry and biology teachers towards the constructivist approach indicated significant differences at the p=0.05 level in all the sub-dimensions. In other words, teachers' attitudes towards the constructivist approach showed significant differences according to their fields of study. To determine the differences among the groups, they were compared to each other and significant differences were found between the physics and biology teachers.

The relationship between the attitudes of teachers towards the constructivist approach and their

professional experiences

Table 9 displays the results of the analysis regarding the positive, negative and self-improvement attitude average scores of teachers towards constructivist approach according to their professional experiences.

Table 9. Teachers' average attitude scores and standard deviations regarding the constructivist approach according to their professional experiences

Constructivist Approach Attitude Scale	Experience	N	$\bar{X}$	SD
Positive attitude	1-10 years	341	3.98	0.597
	11-15 years	441	3.93	0.586
	16-20 years	587	3.94	0.622
	More than 20 years	589	3.94	0.609
	Total	1958	3.95	0.606
Negative attitude	1-10 years	341	2.80	0.272
	11-15 years	441	2.84	0.297
	16-20 years	587	2.85	0.314
	More than 20 years	589	2.86	0.329
	Total	1958	2.84	0.308
Attitudes towards self-improvement	1-10 years	341	4.03	0.619
	11-15 years	441	4.00	0.623
	16-20 years	587	3.98	0.657
	More than 20 years	589	3.97	0.650
	Total	1958	3.99	0.641
General attitude	1-10 years	341	3.70	0.406
	11-15 years	441	3.67	0.420
	16-20 years	587	3.68	0.435
	More than 20 years	589	3.68	0.429
	Total	1958	3.68	0.425

Table 9 displays the differences among the average attitude scores of teachers towards the constructivist approach according to their years of experience in the profession. ANOVA analysis was performed in order to determine whether the differences were significant and the results were presented in Table 10.

Table 10. Attitudes of teachers towards the constructivist approach according to the experience variable: One-way ANOVA

	Source of variance	Sum of squares	df	Mean of squares	F	p
Positive attitude	Intergroup	0.558	3	0.186	0.506	0.678
	Intragroup	718.340	1954	0.368		
	Total	718.898	1957			
Negative attitude	Intergroup	0.810	3	0.270	2.839	0.037*
	Intragroup	185.894	1954	0.095		
	Total	186.705	1957			
Attitude Towards Self-Improvement	Intergroup	1.057	3	0.352	0.856	0.463
	Intragroup	804.054	1954	0.411		
	Total	805.111	1957			
General Attitude	Intergroup	0.129	3	0.043	0.238	0.870
	Intragroup	353.579	1954	0.181		
	Total	353.708	1957			

*p<0.05

The values in Table 10 indicated that there was not a statistically significant difference in all sub-dimensions; however, there was a statistically significant difference in the negative attitude dimension. Tukey tests, which were performed to identify in which experience levels these differences in question occurred, indicated that there was a significant difference between the 1-10 years of experience and the experience of 20 years and more. There were no significant differences in other experience groups.

CONCLUSION AND DISCUSSION

In this study, attitudes of Physics, Chemistry and Biology teachers towards the constructivist approach were analyzed in terms of certain variables. One of the characteristics of the constructivist approach practices that distinguish them from the other practices is the teachers who guide their learners' thoughts instead of transmitting the knowledge and act as an individual to ensure their students' questioning the knowledge (Vermette & Foote, 2001). Teachers guide their students to structure the knowledge and provide them with examples from everyday life to associate the new knowledge with the previous ones. Briefly, the role of the teacher in the constructivist approach is a guider creating appropriate opportunities for the students to structure the knowledge (Taber, 2000). It is believed to be quite essential for the education and training practices to understand the reasons of teachers' attitudes, to identify the factors developing these attitudes and to learn about the competencies of teachers. Teachers need to have more personal competencies and qualifications in order to ensure that students structure, interpret and develop the topics. Hence, changing understandings and life opinions, which are continuously shaped through attaining new dimensions, require reshaping in the teaching profession in order to comply with these rapid changes. Rather than being an individual that teaches in front of the board in the classroom, a teacher is defined as an actor in a play, who appears in a different identity every day in the classroom.

Changes in the world of education about teaching and learning have led to changes in the definition of a teacher as well as introducing a new model, which is quite different from the traditional one (Borko & Putnam, 1996; Sallouma & BouJaoude, 2008; Shulman, 1986; 1987). Today, teachers are perceived as the interpreters of scientific phenomena and play an important role in presenting students with appropriate, meaningful and exemplified definitions (Mortimer & Scott, 2003; Ogborn, Kress, Martins & McGillycuddy, 1996; Scott, Mortimer & Aguiar, 2006; Stefani & Tsaparlis, 2009). The analysis of the correlations between the attitudes towards constructivist approach and the variables of gender, education level, participation in in-service training activities, professional competence experience indicates that female teachers have more positive attitudes towards the constructivist approach than the male teachers. In the same way, teachers with graduate degrees and participating in in-service training have higher attitude scores for the constructivist approach. Moreover, teachers who find themselves competent in their professions and are senior teachers have more positive attitudes towards the constructivist approach. In a study conducted by Ocak (2010) to determine the attitudes of primary school teachers towards constructivist learning practices, it was concluded that the attitudes towards the constructivist approach did not vary according the gender variable. In the same study, it was specified that the attitudes of teachers with 1-5 years of experience towards the constructivist approach were significantly lower than the attitude scores of teachers with 11 or more years of experience. According to another study by İnel, Türkmen and Evrekli (2010) to investigate the prospective primary school teachers' attitudes towards the constructivist approach, it was highlighted that prospective female teachers have more positive attitudes than prospective male teachers. Eskici (2013) found out that the attitudes of primary school teachers towards the constructivist approach practices showed no significant differences according to the years of experience, fields of study, gender, work department, education level (undergraduate or graduate); however, the attitudes were significantly different in terms of the in-service training activities regarding the constructivist approach. The present study investigated the attitudes of teachers towards the constructivist approach according to their professional competence perceptions. As a result, it was concluded that teachers who accept themselves as competent in their professions had positive attitudes. The related literature includes studies to determine the relationship between the attitudes of teachers towards the

constructivist approach and their self-efficacy feelings, perceptions and beliefs. According to these studies, it can be claimed that there is a correlation between the attitudes towards the constructivist approach and self-efficacy (Çayak, 2014; Eskici, 2013; Kasapoğlu & Duban, 2012; Narayan & Lamp, 2010).

The findings of many research studies are also consistent with the findings of the current study. Karadağ, Deniz, Korkmaz and Deniz (2008) concluded that although the teachers had positive attitudes for the constructivist approach, they were doubtful about its practices. Evrekli, İnel, Balım and Kesercioğlu (2009) found out that teachers had 853 positive attitudes towards the constructivist approach. The present study also came to the conclusion that teachers had generally positive attitudes towards the constructivist approach. Çınar, Teyfur and Teyfur (2006) investigated the opinions of primary school teachers and administrators regarding the constructivist approach and program. As a result of the research, teachers and administrators had generally positive opinions about the constructivist approach and the lack of infrastructure in the schools was an inhibiting factor in applying the new programs.

The constructivist approach has changed the quality and the roles of education programs, teachers, learners and parents, and the structure of the training practices. The role of authoritarian teacher at the setter of teacher practices has been replaced with an understanding which guides and creates learning opportunities for learners to structure the knowledge. The student profile has gradually changed; s/he has started to develop qualities to think, search and generate ideas. However, the constructivist approach has both negative and positive sides. The related literature criticizes that the constructivist approach highly rejects the objective knowledge by grounding on the subjectivity; undesirable learner behaviors occur as a result of excessive freedom; individuality comes to the forefront (Şimşek, 2004); there are some uncertainties in the practices; technology is intensively needed; it is difficult to administer in crowded classrooms; there are time and evaluation problems. For the constructivist approach, which have many positive results in lots of contemporary countries, to achieve successful results in our country, it is required by the shareholders in the education system (teachers, students, administrators) and the parents to adopt the approach without prejudices, and especially students and teachers must have the necessary qualifications and positive attitudes regarding this education approach. To provide learners with the appropriate constructivist approach practices, biology, physics and chemistry teachers need to develop positive attitudes for the implementation of this education approach. The related literature indicates that gender is an important variable in the use of constructivist approach and many techniques, methods and strategies that support constructivist approach (Aktaş, 2013; Çınar, Teyfur & Teyfur, 2006; İzci & Şardağ, 2016; Ocak, 2010). The aim has to be reducing the differences between the genders and eventually eliminating them. However, as the current study is a case study, it has been found appropriate to examine gender factor among the other demographic variables.

Eventually, today, individuals live in such an environment, where the amount of scientific knowledge continuously increases and great changes are observed in technological innovations. In such a world, where rapid and continuous changes are experienced, various innovations are observed to occur in various fields of the education as well as the science education. The developments and trends in science education ensure continuous improvement in the teaching environments of physics, biology and chemistry, and even it is a must. The quality of biology, physics and chemistry education has an essential role in the future of the societies. Therefore, in the current changing education and teaching approach, all societies are trying to improve the quality of science education. Effective science teaching not only involves searching for the scientific facts by the students but also is essential for ensuring that students develop a life philosophy, which enables them to learn about experimental measures as well as logical, critical and reflective thinking. In biology, physics and chemistry teaching environments, students learn about the processes of observation, hypothesis development, testing, data collection, data-interpretation and presentation of the findings by using scientific methods, and they attain scientific thinking skills through integrating their imagination and creativity into these processes. In order students to have these skills and competence, science teachers need to adopt the constructivist approach. Therefore, science teachers at upper-secondary schools should have the required knowledge and skills to train their students in accordance with the aforementioned objectives. At this point of view, science teachers at secondary schools should implement the constructivist approach in their lessons as much as possible. Hence, although constructivism

has been criticized for its certain aspects, it is still an approach that needs to be adopted in terms of providing positive feedback to teachers about student attainments, improving potentials of the students and increasing the level of performance.

ACKNOWLEDGEMENT

We would like to thank Turkish Ministry of National Education for their contribution to the study through the collection of the data from the teachers based in Turkish state schools.

REFERENCES

Aktaş, M. (2013). Assessment of the influence of 5E learning method and cooperative learning method on biology attitude in terms of gender. *Ondokuz Mayis University Journal of Faculty of Education, 32*(2), 1-19.

Arslan, M. (2007). Constructivist approaches in education. *Ankara University Journal of Faculty of Educational Sciences*, *40*(1), 41-61.

Balım, A. G., Kesercioğlu T., İnel, D. & Evrekli E. (2002, September*). Fen öğretmenleri için yapılandırmacı yaklaşım tutum ölçeği üzerine bir açımlayıcı ve doğrulayıcı faktör analizi çalışması. [A exploratory and confirmatory factor analysis on science teachers contructivist attitudes]*. 5th National Congress of Science and Mathematics Education, METU-Ankara-Turkey.

Baş, G. (2011). Türkiye'de eğitim programlarında yapılandırmacılık: Dün, bugün, yarın. *Eğitişim Dergisi*, 32. Retrieved October 19, 2016 from http://www.egitisim.gen.tr/tr/index.php/arsiv/sayi-31-40/sayi-32-ekim-2011/739-turkiye-de-egitim-programlarinda-yapilandirmacilik-dun-bugun-yarin

Borko, H., & Putnam, R. T. (1996). Learning to teach. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of educational psychology* (pp.673-708). New York: McMillan.

Boydak, A. (2008). *Yeni öğretim programlarına temel olan yaklaşımlar*. İstanbul: Beyaz Yayınları.

Buluş, M., Duru, E., Balkıs, M., & Duru, S. (2011). The role of learning strategies and ındividual characteristics in predicting academic achievement in prospective teachers. *Education and Science, 36*(161), 186-197.

Cengiz, C., & Serbes, Ş. (2014). Turkish pre-service physical education teachers' self-reported use and perceptions of teaching styles. *Pamukkale Journal of Sport Sciences, 5*(2), 21-34.

Çayak, S. (2014). Primary school teachers' self-efficacy beliefs and attitudes about the implementation of the constructivist approach. *Mehmet Akif Ersoy University Journal of Education Faculty,* 31, 88-110.

Çınar, O., Teyfur, E., Teyfur, M.(2006). Primary school teachers and administrators' views about constructivist education approach and programs. *Inönü University Journal of the Faculty of Education, 7(11), 47-64.* Retrieved March 27, 2016 from https://pegem.net/dosyalar/dokuman/8290-20110628172837-ocinar.pdf

Duman, B. (2007). *Eğitimde çağdaş yaklaşımlar. Öğretim ilke ve yöntemleri. [Modern approaches in education: Teaching methods and principles]*. G.Ocak (Ed). (pp.267-385). Ankara: PegemA Yayıncılık.

Eskici, M. (2013). *İlköğretim öğretmenlerinin yapılandırmacı yaklaşıma ilişkin özyeterli algıları ve tutumları.* [*Primary school teachers self-efficacy perceptions and attitudes about the constructivist approach].* Doctoral Dissertation, Abant İzzet Baysal University, Bolu, Turkey.

Evrekli, E., İnel, D., Balım, A.G., Kesercioğlu,T. (2009). The attitude scale of constructivist approach for prospective science teachers: A study of validity and reliability*. The Journal of Turkish Science Education, 6(2).134-148.*

Glasersfeld, E.V. (1995). A constructivist approach to teaching. In L.P. Steffe &J. Gale (Eds). *Constructivism in education*. Hillsdale, New Jersey Hove, UK: Lawrence Erlbaum Associates, Publishers.

Hançer, A.H., & Yalçın, N. (2007). The effects of 'computer based learning based upon constructivist approach in science education' on attitudes toward computers. *Kastamonu Education Journal*, *15*(2), 549-560.

İnel, D., Evrekli, E., & Türkmen, L. (2010, September). *Sınıf öğretmeni adaylarının yapılandırmacı yaklaşıma ilişkin görüşlerinin ve tutumlarının incelenmesi: Uşak Üniversitesi örneği*. *[Investigating class masters' opinions and attitudes towards constructivism: Sample of Uşak University].* IX. National Congress of Science and Mathematics Education, İzmir, Turkey.

İngeç, Ş. & Aytekin K. Ü. (2010, September). *Ortaöğretim öğrencilerinin ısı ve sıcaklık konusundaki bilgileri ve bu bilgilerini günlük hayata uyarlama düzeyleri üzerine bir araştırma.* [*A study on the knowledge of secondary school students about the heat and temperature and utilising from this knowledge in their daily lives*]. IX. National Congress of Science and Mathematics Education, İzmir, Turkey.

İzci, K., & Şardağ, M. (2016). Prospective science teachers' perceptions of classroom assessment. *Necatibey Faculty of Education Electronic Journal of Science and Mathematics Education, 10*(1), 439-471.

Karadağ, E., Deniz, S., Korkmaz, T., & Deniz, G. (2008). Yapılandırmacı öğrenme yaklaşımı: Sınıf öğretmenleri görüşleri kapsamında bir araştırma. [Constructivist learning approach: A research about view of class masters]. *Uludağ University Journal of Education*, *21*(2), 383-402.

Kasapoğlu,. K. & Duban, N. (2012). Sınıf öğretmeni adaylarının yapılandırmacı yaklaşımı uygulamaya yönelik öz yeterlik inançlarını yordayan bir faktör olarak yapılandırmacı yaklaşıma yönelik tutumları (Afyonkarahisar ili örneği). [Pre-service classroom teachers' attitude toward the constructivist approach as a predictor of their self-efficacy for the ımplementation of the constructivist approach (A case of Afyonkarahisar)]. *Mersin University Journal of the Faculty of Education*, 8(2), 85-96.

Koray, Ö., Akyaz N., & Köksal, M. S. (2007). The observed concept errors about the "resolution" subject in the daily life events of the lycee students. *Kastamonu Education Journal*, *15*(1), 241-250.

Kurtdede Fidan, N., & Duman, T. (2014). Classroom teachers' possession level of characteristics required by the constructivist approach. *Education and Science, 39*(174), 143-159.

MEB (2005). *İlköğretim 1-5. sınıf programları tanıtım el kitabı*. Ankara: Devlet Kitapları Müdürlüğü Basımevi.

Mortimer, E.F., & Scott, P. (2003). *Meaning making in secondary science classroom*. Maidenhead: Open University Press.

Narayan, R. & Lamp, D. (2010). "Me? Teach science?" Exploring EC-4 pre-service teachers' self efficacy in an inquiry-based constructivist physics classroom. *Educational Research and Reviews*, 5 (12), 748-757.

Ocak, G. (2010). Teacher attitudes towards constructivist learning practices. *Gazi University Journal of Gazi Educational Faculty,* 30(3), 835-857.

Ogborn, J., Kress, G., Martins, I., & McGillycuddy, K. (1996). *Explaining science in the classroom*. Milton Keynes: Open University Press.

Özmen. H. (2003). Chemistry student teachers' levels of linking their knowledge with daily life about acid and base concepts. *Gazi University Kastamonu Education Journal*, *11*(2), 317-324.

Özmen, H. & Yıldırım N. (2005). Effect of work sheets on student's success: Acids and bases sample. *Journal of Turkish Science Education, 2*(2), 124-143.

Özsevgeç, L. C., & Ürey, M. (2010, September). *Sınıf öğretmenliği öğrencilerinin fen bilgilerini günlük yaşamdaki durumlara uygulayabilme düzeyleri. [Prospective primary teachers' implementation level of science knowledge to daily life situations].* IX. National Congress of Science and Mathematics Education, İzmir, Turkey.

Öztürk, Ç.(2008). *The effects of 5e model on the scientific process skills, academic achievement and attitude towards the geography course*. Doctoral dissertation, Gazi University Institute of Educational Sciences, Ankara-Turkey.

Sallouma S. L., & BouJaoude S. (2008). Careful! It is H_2O? Teachers' conceptions of chemicals. *International Journal of Science Education, 30*(1), 33–64.

Scott, P.H., Mortimer, E.F., & Aguiar, O.G. (2006). The tension between authoritative and dialogic discourse: A fundamental characteristic of meaning making interactions in high school science lessons. *Science Education, 90*, 605–631.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4-14.

Shulman, L. S. (1987). Knowledge and teaching: Foundation of the new reform. *Harvard Educational Review, 57*, 1–22.

Stefani, C., & Tsaparlis G. (2009). Students' levels of explanations, models, and misconceptions in basic quantum chemistry: A phenomenographic study. *Journal of Research in Science Teaching, 46*(5), 520-536.

Sünbül, A. M. (2007). *Öğretim ilke ve yöntemleri. (2. baskı).* Konya: Çizgi Kitabevi.

Şimşek, N.(2004). Yapılandırmacı öğrenme ve öğretime eleştirel bir bakış. [Critical point of view on cantructivist learning-teaching]. *Educational Sciences&Practice, 3*(5), 115-139.

Taber, K. S. (2000) Chemistry lessons for universities?: A review of constructivist ideas. *University Chemistry Education*. 4(2), 63-72.

Toker, B. (2007). The effects of demographic factors on job satisfaction: An application on five and four star hotels in Izmir. *Doğuş University Journal*, 8(1), 92-107.

Vermette, P. & Foote, C. (2001). Constructivist philosophy and cooperative learning practice: Toward integration and reconciliation in secondary classrooms. *American Secondary Education.* 30(1), 26-37.