Determination of Science and Primary Teachers' Teaching and Learning Conceptions and Constructivist Learning Environment Perceptions

Tuğba Ecevit [i]
Duzce University

Pınar Özdemir [ii]
Hacettepe University

Abstract

The significance of both science education and scientific communication has increased in parallel to the increase in scientific knowledge and rapid advances in technology. In producing students who have science literacy, skills of scientific process and higher-level thinking skills teaching-learning approach of teachers and communication between teachers and students are very significant. The purpose of this study is to determine the science teachers' and primary teachers' learning and teaching conceptions and constructivist learning environment perceptions. The sample of the study consists of 100 participants from science teachers and primary teachers working at the public schools in the Central Anatolia region. "Easily accessible sampling method" was used for the selection of the participants. The study is quantitative research and a survey method that is directed to the determination of the current state has been used. Teaching-Learning Conceptions Questionnaire (TLCQ) and Constructivist Learning Environment Survey (CLES) have been used as the means of data collecting. The findings of the study suggest that the classroom teachers had a constructivist approach in contrast to a conventional approach in regard to learning and teaching. Similarly, it was found that the science teachers had a constructivist approach in contrast to a conventional approach in regard to learning and teaching. It was found that the participants generally had a constructivist approach and that their perception of the constructivist learning setting is higher than the medium level. It was also found that the science teachers had higher perceived levels of about constructivist learning setting than the classroom teachers. The results of the MANOVA indicated that the professional experience of the participants had a significant effect on the perception levels about the constructivist learning-teaching approach. That's why the research for the reflections in application gains importance in this study.

Keywords: Constructivist Learning Environment Perceptions, Primary Teachers, Science Lesson, Science Teachers, Teaching And Learning Conceptions

DOI: 10.29329/ijpe.2020.248.11

---

[i] **Tuğba Ecevit,** Assist. Prof. Dr., Science Education, Duzce University, ORCID: 0000-0002-5119-9828

Correspondence: tubaecevit@hacettepe.edu.tr

[ii] **Pınar Özdemir,** Assoc. Prof. Dr., Science Education, Hacettepe University, ORCID: 0000-0002-0360-4446

INTRODUCTION

Nowadays in which we are living the fourth industrial revolution, scientific information is increasing rapidly, and the rapid progress of technology is increasing the need for science-literate individuals in society. Science Curriculum in Turkey, it is suggested teachers to use the inquiry-based learning approach to train science-literate individuals (Ministry of National Education [MNE], 2013; 2018).

It has been argued that there are two major learning-teaching approaches dominating teaching practices (Schunk, 2008): (a) conventional approach and (b) constructive approach (Aypay, 2011; Bıkmaz, 2011; Chan and Eliot, 2004; Cheng, Chan, Tang and Cheng, 2009; Eryaman, 2007; Şahin and Yılmaz, 2011; Schunk, 2008). It has been suggested that in order for teachers to offer efficient and productive teaching they should employ and follow a constructivist teaching approach of which the focus is on students. The major goal for the constructivist teaching approach is to produce sound and long-lasting learning as well as to improve higher-level cognitive skills (Şaşan, 2002). In a constructive learning environment students should be active participants and teachers, on the other hand, do not just transmit knowledge, but are facilitators in that they guide students in constructing knowledge and in discovering the meaning (Dunlop and Grabinger, 1996).

For the teachers who adopt a conventional approach there is no concern about active student participation and in conventional learning–teaching environments teachers are the sole authority and they themselves guide the environment (Brooks and Brooks, 1999). Such teachers ask questions and attempt to give correct answers from students. In such environments students memorize the information, resulting in that full learning does not take place. Conventional learning and teaching techniques employed in science education are mostly insufficient for concept teaching and direct students to memorize the information offered by teachers. These techniques do not support reducing student misconceptions about topics that require definition, explanation, and prediction (Hewson, 1981; Posner, Strike, Hewson and Gertzog, 1982).

The learning environment has significant effects on student learning. Research suggests that teachers should take into consideration the significant impacts of the learning environment on learning (Fisher and Fraser, 1981; Simpson and Oliver, 1990; Riedler & Eryaman, 2016; Taylor and Fraser; 1991; Taylor, Fraser and Fisher, 1997). In learning and teaching environments based on constructivist approach students take the responsibility of their learning and are active participants of the learning process. Learning and teaching environments based on constructivist approach support for students' active participation, students' questions about the topic at hand, explanations about their thinking, development of alternative perspectives, discussions, and reflections about the topic. Such an environment encourages students to develop their own plans for learning and allows students to learn the topic in their unique way (Taylor and Fraser; 1991; Taylor et. al., 1997). In short, learning and teaching environments based on the constructivist approach contributes to long-lasting learning and to improve high-level cognitive skills. In constructivist environments, there is efficient communication between teachers and students and students discuss and exchange their ideas with their peers. In addition, students are offered opportunities to have information about topics from daily life and in turn, they can employ their learning in daily life situations (Acat, Anılan and Anagün 2007).

Dialogues in a classroom environment between students and teachers and between students have significant effects on student learning (Ecevit and Çakmakcı, 2017). Such communication is reported to have significant effects in improving students' independent thinking, critical thinking and the skills of problem-solving and of reasoning. Teachers may employ the following questions to improve students' scientific communicative skills: "What do you think about it?", "How did you solve the problem?", "Why do you think in this specific way?", "Is it correct for you?", "Who wants to summarize what your friend has explained?" , "What do you think about this topic?", "Do you have any objection?", "Is there anyone to add something to it" (Scott, Mortimer and Aquiar, 2006).

Effective science education is very important nowadays in which the fourth industrial revolution, where scientific knowledge and technology develop rapidly. Teaching and learning approaches and constructivist learning environments that teachers have in order to educate students with scientific literacy, inquiry, questioning, high-level thinking 21st-century skills are very important. It can be stated that there are nearly no studies (Head, 2014, January, January and Kalender, 2017) related to teachers' teaching-learning understandings in which the research of the teacher-learnings understanding of the teacher candidates is examined (Aypay, 2011; Bıkmaz, 2011; Oğuz, 2011). It is very important to investigate the teaching-learning attitudes that teachers have and to organize in-service training of teachers in this direction. In this study, it is aimed at revealing the learning-teaching approach of science and classroom teachers and their perceptions about constructivist learning environments.

Research Problem

In parallel to this aim, the study tries to answer the following research questions: How do the teachers' conceptions of learning-teaching and constructivist learning environment perceptions according to the field of teaching, the gender, and the teaching experience?

METHODOLOGY

Research Design

The study was designed as quantitative research. It included and employed a comparative survey method which attempts to provide a description of a specific situation. Scanning model is a research technique which also tries to describe a situation of past or present as it is (Balcı, 2001; Fraenkel and Wallen, 1993; Karasar 2005; Yıldırım and Şimşek, 2004).

Research Sample

The participants of the study were science teachers and classroom teachers working at public schools in Turkey’s central Anatolia during the school year of 2014-2015. More specifically, 100 teachers participated in the study. Of them, 61 were classroom teachers and 39 were science teachers. On the other hand, of the 44 were females and 56 were males. Table 1 shows demographic information about the participants including their field of teaching, gender and the year of teaching experience.

Table 1. Demographic information about Participants

Field of Teaching	**N**	**%**
Primary Teacher	61	61
Science Teacher	39	39
Gender		
Female	44	44
Male	56	56
Teaching Experience		
1-5 year	18	18
6-10 year	25	25
11-20 year	41	41
20 year	16	16

Research Instrument and Procedure

Teaching-Learning Conceptions Questionnaire (TLCQ)

In order to reveal the dominant learning-teaching approach adopted by the participants the scale of teaching and learning developed by Chan and Elliot (2004) was used. Aypay (2011) adapted the scale into Turkish and carried out the reliability and validity analysis of the scale. It is a five-point Likert-type scale and has two dimensions as well as 30 items. The dimensions of the scale are the constructivist approach and the conventional approach. There are twelve items about the first dimension and eighteen items about the second one. The items are answered through five options: 1 "totally disagree", "2" disagree, "3" undecided," "4" agree, and "5" totally agree. The reliability coefficient of the first dimension, the constructivist approach, is .86, that of the second factor, the conventional approach, is .83. It is .84 for the scale as a whole.

Within the scope of this research, the Cronbach's Alpha reliability coefficients of the scale used to collect the data were analyzed through the reliability test. For the conventional approach dimension of the scale of the learning-teaching approach it was found to be .87 and for the constructivist approach dimension of the scale, it was found to be .79. The Cronbach's Alpha reliability coefficient for the scale as a whole was found to be .87.

Constructivist Learning Environment Survey (CLES)

In order to uncover the perceptions of the participants about the constructivist learning-teaching environment the scale of a constructivist learning environment developed by Taylor and Fraser (1991) was used. The scale was revised by Ibera (2005) and adapted into Turkish by Acat et. al. (2007). It is again a five-point Likert-type scale and has six dimensions and 25 items. The dimensions of the scale are as follows: learning the world which has six items, learning science which includes four items, learning to express his own views which have four items, learning to learn which covers three items, learning to communicate scientifically which has five items, and the approach towards the class which includes three items. Answers to the items have the following options: 1 none, 2 rarely, 3 sometimes, 4 frequently, and 5 every time.

Table 2. Dimensions of and Sample Items from the Scale of Constructivist Learning Environment

Sub-Dimension	Examples of Substances
Personal Relevance- Learning about the Word	Students understand life outside the school better in science classes.
Scientific Uncertainty- Learning about science	Students would learn that science has changed over time
Critical Voice- Learning to Speak out-	It was OK for student to ask me "why do I have to learn this?"
Shared Control- Learning to Learn	In science lessons, students can help teach what they will learn.
Student negotiation- Learning to Communicate	In science lessons, students may want to explain each other's reasons for their ideas.
Attitude Towards Class	Students are eagerly awaiting learning activities in science classes.

Within the scope of this research, the Cronbach's Alpha reliability coefficients of the scale used to collect the data were analyzed through the reliability test. For the dimensions of the scale of constructivist learning environments the Cronbach's Alpha reliability coefficients were found to be as follows: .73 for the dimension of learning the world, .64 for the dimension of learning science, .70 for the dimension of learning to express his own views, .60 for the dimension of learning to learn, .79 for the dimension of learning to scientifically communicate and .62 for the dimension of the approach towards the class. It was found to be .89 for the scale as a whole.

These values show that the scales are reliable and serve the aim of the study. Before the administration of the data collection tools, the participants were informed about the study and their permission was granted. Of the data collection tools, the scale of teaching and learning was first administered. Following the administration of this scale, the participants rested for 20 minutes before the administration of the other one.

Data Analysis

The data collected were analyzed by using the SPSS 22.0 (Statistic Package for Social Sciences). Descriptive statistics and one-way MANOVA. The use of MANOVA requires the analysis of the hypotheses about MANOVA. The related hypotheses were as follows: single and multivariable normality, extreme values, linearity, multiple linear equations and singularity, homogeneity of the variance-covariance matrix (Pallant, 2005). Single variable normality was analyzed using the test of normality and found that the value of Kolmogorov-Smirnov was statistically significant [KSZ=.200, $p<.05$]. Therefore, this finding showed that the data were found to have a normal distribution. For multivariable normality, the Mahalanobis offset value was employed. There were eight dependent variables of the study, namely the conventional learning-teaching approach, constructivist learning-teaching approach, learning the world, learning science, learning to express his own views, learning to scientifically communicate and the approach towards the class. Pearson and Hartley (1958) argued that for a study with a dependent variable the critical value for the Mahalonobis distance is 26.13. The values higher than this are regarded as the extreme values of the Mahalanobis offset value. In this study the Mahalanobis off set value was found to be 24.22 (Pallant, 2005). Linearity among the independent variables was analyzed and it was found that there was a linear correlation among them. Pallant (2005) argued that among all binary combinations of dependent variables has a linear correlation. Concerning the homogeneity of the variance-covariance matrix, the statistically insignificance of the Box's M test indicates that this hypothesis is met (Pallant, 2005; Tabachnick and Fidell, 2007). In the study, it was found that for the scale of learning-teaching approach Box's M is 1.138 [p= .263], and for the scale of constructivist learning environments, it is 1.070 [p= .313]. Given that all hypotheses related to MANOVA were met, it was used in the study. Although this test may be used for different aims, in the study it was specifically used for variance analysis. The reason why MANOVA was selected in this study was that in ANOVA, the analyses were carried out for one dependent variable in terms of independent variables in each case, as MANOVA gave the opportunity to test more than one dependent variable for the same independent variables with less error. Therefore it was possible to demonstrate all the results in one table without unnecessary repetitions.

RESULTS

The findings about the research problems are given as follows:

According to Teachers' Field of Teaching

a- How are the teaching-learning conceptions and constructivist learning environment perceptions?

b- Is there any significant difference among the levels of teaching-learning conception?

c- Is there any significant difference among the perceptions of the constructivist learning environment?

As given above the first research question is about the perceptions of the teachers about the learning-teaching approach and the constructivist environments. Descriptive statistics and MANOVA were employed to see whether or not the data collected differed. The results are given in Table 3.

Table 3. Results of descriptive Statistics and Test of between Subject Effects According to Teachers' Field of Teaching

Dimension	Branch	Mean X	Std Deviation	N	F	Sig
Conventional Teaching- Learning Conceptions	Primary Teacher	3,37	,65	58	0,247	,621
	Science Teacher	*3,49*	,58	39		
Constructivist Teaching-Learning Conceptions	Primary Teacher	4,45	,42	58	2,004	,161
	Science Teacher	*4,49*	,43	39		
Personal Relevance- Learning about the Word	Primary Teacher	3,88	,47	57	0,114	,737
	Science Teacher	*4,08*	,62	38		
Scientific Uncertainty- Learning about science	Primary Teacher	3,48	,55	57	1,491	,226
	Science Teacher	*3,51*	,68	38		
Critical Voice-Learning to Speak out	Primary Teacher	*3,59*	,68	57	3,567	,063
	Science Teacher	3,56	,72	38		
Shared Control- Learning to Learn	Primary Teacher	3,24	,74	57	0,038	,846
	Science Teacher	*3,44*	,74	38		
Student negotiation- Learning to Communicate	Primary Teacher	3,95	,56	57	0,681	,412
	Science Teacher	*4,04*	,62	38		
Attitude Towards Class	Primary Teacher	4,13	,59	57	0,13	,689
	Science Teacher	*4,17*	,58	38		

Descriptive statistics showed that the classroom teachers had a constructive approach (X= 4,45) rather than a conventional approach (X=3,37). Similarly, science teachers were found to have a constructive approach (X= 4,49) rather than the conventional approach (X=3,49). The perceptions of science teachers about the constructivist learning environment were found to be higher than those of classroom teachers. On the other hand, the learning and teaching approach of the teachers participated in the study according to questionnaire consisting of two dimensions and analyzed with two-way MANOVA was not significantly different based on their field of teaching ($p < .05$) [Wilks'Lambda= 0,975 F(2, 80)=1,013 p=,368 ES=,025 Power=,221]. Similarly, as the constructivist learning environment survey included six dimensions, MANOVA was applied and according to the findings, perceptions of the teachers participated in the study was not significantly different according to their branch ($p < .05$) [Wilks'Lambda= 0,913 F(6, 75)=1,196 p=,318 ES=,087 Power=,443]

According to Teachers' Gender

a- How are the teaching-learning conceptions and constructivist learning environment perceptions?

b- Is there any significant difference among the levels of teaching-learning conception?

c- Is there any significant difference among the perceptions of the constructivist learning environment?

As given above the second research question is about the perceptions of the teachers about the learning-teaching approach and the constructivist environments. Descriptive statistics and MANOVA were employed to see whether or not the data collected differed. The results are given in Table 5. Female participants were found to have a constructive approach (X= 4,51) rather than the conventional approach (X=3,45). Similarly, male participants were found to have a constructive approach (X=4,43) rather than a conventional approach (X=3,39). The perceptions of female teachers about the constructivist learning environment were found to be higher than those of male teachers.

Table 4. Results of Descriptive Statistics and Test of between Subject Effects based on Gender

Dimension	Gender	Mean X	Std Deviation	N	F	Sig
Conventional Teaching- Learning Conceptions	Female	3,45	,63	42	0,201	,655
	Male	3,39	,61	55		
Constructivist Teaching-Learning Conceptions	Female	4,51	,40	42	0,521	,473
	Male	4,43	,43	55		
Personal Relevance- Learning about the Word	Female	4,09	,57	41	1,870	,175
	Male	3,86	,50	54		
Scientific Uncertainty- Learning about science	Female	3,59	,68	41	0,073	,788
	Male	3,41	,52	54		
Critical Voice-Learning to Speak out	Female	3,66	,75	41	0,553	,459
	Male	3,51	,63	54		
Shared Control- Learning to Learn	Female	3,22	,78	41	0,072	,790
	Male	*3,32*	,70	54		
Student negotiation- Learning to Communicate	Female	4,09	,59	41	0,464	,498
	Male	3,90	,57	54		
Attitude Towards Class	Female	4,20	,59	41	0,277	,600
	Male	4,09	,58	54		

As can be seen in Table 4, gender was found to have no statistically substantial effect of the participants' learning and teaching approach (p< .05) [Wilks'Lambda= 0,989 F(2, 80)=0,438 p=,647 ES=,011 Power=,119]. Similarly, gender was found to have no significant effect on their perceptions about the constructivist learning environment (p< .05) [Wilks'Lambda= 0,957 F(6, 75)=0,556 p=,764 ES=,043 Power=,210].

According to Teachers' Teaching Experience

a- How are the teaching-learning conceptions and constructivist learning environment perceptions?

b- Is there any significant difference among the levels of teaching-learning conception?

c- Is there any significant difference among the perceptions of the constructivist learning environment?

In order to answer the third research question both scales were used. The related results are given in Table 5.

Table 5. Results of Descriptive Statistics and Test of between Subject Effects based on the Teaching Experience

Dimension	Teaching Experience	Mean X	Std Deviation	N	F	Sig
Conventional Teaching- Learning Conceptions	1-5 year	3,64	,70	18	3,373	,022
	6-10 year	3,60	,42	24		
	11-20 year	3,31	,57	40		
	20 year	3,13	,77	15		
Constructivist Teaching-Learning Conceptions	1-5 year	4,56	,40	18	3,603	,011
	6-10 year	4,55	,46	24		
	11-20 year	4,44	,34	40		
	20 year	4,28	,53	15		
Personal Relevance- Learning about the Word	1-5 year	3,97	,53	18	4,409	,006
	6-10 year	4,10	,53	24		
	11-20 year	4,00	,41	40		
	20 year	3,64	,76	15		

Scientific Uncertainty- Learning about science	1-5 year	3,58	,51	18	0,734	,535
	6-10 year	3,60	,48	24		
	11-20 year	3,39	,68	40		
	20 year	3,48	,65	15		
Critical Voice-Learning to Speak out	1-5 year	3,60	,66	18	2,240	,090
	6-10 year	3,77	,63	24		
	11-20 year	3,50	70	40		
	20 year	3,41	74	15		
Shared Control- Learning to Learn	1-5 year	3,24	,62	18	1,965	,126
	6-10 year	3,70	,52	24		
	11-20 year	3,23	,79	40		
	20 year	3,02	,83	15		
Student negotiation- Learning to Communicate	1-5 year	4,10	,61	18	2,328	,081
	6-10 year	4,19	,49	24		
	11-20 year	3,87	,58	40		
	20 year	3,79	,63	15		
Attitude Towards Class	1-5 year	4,20	,57	18	0,589	,624
	6-10 year	4,19	,58	24		
	11-20 year	4,12	,53	40		
	20 year	4,07	,75	15		

It was found that the teaching experience had a significant effect on the learning and teaching approach of the participants ($p < .05$) [Wilks'Lambda= 0,814 F(2, 160)=2,886 p=,011 ES=,098 Power=,884]. The Post-Hoc Tukey test was employed to find the source of this difference and it was found that there was a statistically significant difference between teachers with a teaching experience of 6-10 years and those with a teaching experience more than 20 years [p=.048]. Similarly, Teaching experience was found to have no remarkable effect of the participants' learning and teaching approach ($p < .05$) [Wilks'Lambda= 0,720 F(18, 212)=1,456 p=.109 ES=,104 Power=,865]. It was found that the teaching experience of the participants led to an important difference in the dimension of learning the world of the scale of the constructivist learning environment [p=.006]. The results of the Post-Hoc Tukey test showed that there was a statistically significant difference between teachers with a teaching experience of 6-10 years and those with a teaching experience of more than 20 years [p=.036].

According to both the Teachers' Teaching Experience and Field of Teaching

a- How are the teaching-learning conceptions and constructivist learning environment perceptions?

b- Is there any significant difference among the levels of teaching-learning conception?

c- Is there any significant difference among the perceptions of the constructivist learning environment?

In order to answer the fourth research question both scales were used. Descriptive statistics and MANOVA were employed to see whether or not the data collected differed. Neither teaching experience nor the field of teaching was found to have no remarkable effect of the participants' learning and teaching approach ($p <. 05$) [Wilks'Lambda= 0,877 F(6, 160)=1,816 p=,099 ES=,064 Power=,668]. Similarly, For the perceptions of the participants about the constructivist learning environment neither teaching experience nor the field of teaching were found to have significant effects ($p < .05$) [Wilks'Lambda= 0,726 F(18, 212)=1,4514 p=.127 ES=,101 Power=,852].

However, both the teaching experience and the field of teaching were found to have significant effects on the dimensions of learning to express own views and of learning to learn [p values; p=.032 and p=.045, respectively]. In order to reveal the reason for this the Post-Hoc Tukey test was employed. It was found that there was a statistically significant difference in these dimensions between teachers with a teaching experience of 6-10 years and those with a teaching experience more than 20 years [p values; p=.024 and p=.048, respectively].

DISCUSSION AND CONCLUSION

As a result of the data analysis, it was determined that both classroom teachers and science teachers had a constructivist understanding in general. However, it is very obvious that teachers continue to adopt the traditional teaching-learning approach into their teaching environment. This finding is consistent with the findings of the study conducted by Baş (2014) with Engin and Daşdemir (2015). This finding is also consistent with the findings of the studies conducted with the teacher candidates (Aydın, Tunca and Şahin, 2015, Aypay, 2011, Bıkmaz, 2011, Cheng et al., 2009, Oğuz, 2011, Şahin and Yılmaz, 2011). It can be stated that there are a change and development from the traditional understanding of the student-centered understanding that is constructivist understanding, in the science curriculum. This finding is thought to be a reflection of the fact that since 2004 the basic education programs have been developed based on the constructivist principles. Today teachers are expected to adopt a constructivist approach and to employ it in courses. However, the majority of teachers continue to tend to traditional understanding because of the fact that they have learned through teacher-centered understanding, although they usually say that they support constructivist understanding (Bıkmaz, 2017). In this context, it can be stated that science and classroom teachers tend to teach science in their classroom in the same way how they learn science in their primary and secondary school years, even during their higher education. Eren (2009) found that teacher candidates were more prone to the traditional teaching-learning mentality and interpreted it as the reason that teacher candidates were involved in the role models they encountered in their previous learning experiences. Anagün, Yalçınoğlu and Ersoy (2012) found that the teachers 'beliefs about science and technology teaching-learning process supported the constructive teaching program in their practice, but the teachers' beliefs were not reflected to their class as they desired. As seen in Anagün, Yalçınoğlu and Ersoy's work, while teachers support constructivist understanding on the one hand, they continue to tend to traditional understanding on the other hand. In the study conducted by Acat, Anılan and Anagün (2010), classroom teachers were asked to evaluate their own learning environments and it was determined that classroom teachers did not pay enough attention to the experiences of students and did not use the constructivist approach effectively. It can be stated that science teachers mostly use the authoritarian / dialogue communication approach of teacher-student interaction where science teachers mostly use the narrative methods (Karamustafaoğlu, Bayar and Kaya, 2014). Baş and Beyhan (2013) and Chan and Eliot (2004) found that student teachers do not a clear preference over conventional or constructivist approaches.

Although the perceptions of female participants about the constructivist learning-teaching approach were found to be higher than those of male participants, this difference was not statistically significant. This finding is consistent with that of Baş and Beyhan (2013), Cheng et. al. (2009), Engin and Daşdemir (2015). However, it is consistent with the finding Aypay (2011) and Baş (2014) in that it was suggested by the study that gender played a significant role in the perceptions of the teachers about the learning and teaching approach.

In the study, it was found that the teaching experience of the participants had a significant effect on their learning-teaching approach. More specifically, those participants with much longer teaching experience had a conventional approach and those with less teaching experience had a more constructivist-oriented approach. Similarly, in the study conducted by Baş (2014), it was found that the teachers' learning-learning attitudes differed significantly according to the years of professional seniority. In this study, it was determined that younger teachers with lower occupational seniority have a more constructive teaching-learning attitude, while those with more seniority years have more traditional teaching-learning attitudes. On the other hand, it has been determined by the research conducted by Engin and Daşdemir (2015) that the teacher-learning attitudes of the class teachers do not show any significant difference according to the seniority year. The latter studies concluded that the teaching experience of teachers had significant effects on their learning-teaching approach. Similar findings were found in the studies on student teachers in that those in senior grades were found to adopt a conventional learning-teaching approach (Aypay, 2011; Bıkmaz, 2011). It can be argued that novice teachers tend to adopt a constructivist learning-teaching approach due to the effects of teacher training programs. Therefore, through in-service training activities more experienced teachers may be

made more familiar with the constructivist learning-teaching approach. Based on these findings, it is very important to organize in-service training so that teachers with more years of vocational seniority can develop a constructivist teaching-learning approach, and direct and support teachers in this direction. Similarly, teacher candidates should be given the opportunity to apply the research-question-based learning approach during their undergraduate education to teacher candidates. In this way, it might be possible to train science-literate individuals having 21st-century skills.

Creating a constructive learning environment for effective science education is one of the most important factors. It is real that the teaching-learning understanding that teachers have shaped the learning environment in their classroom. As known, the role of the teacher and the student in the constructivist learning environment is sharply contrary to his role in the traditional learning environment. The role of the teacher in the traditional learning environment; to explain the correct solution ways, to present open and resolvable problems to the students, to convey the knowledge that is possessed in order to provide silence and focus to the class in a clear and structured way. In contrast, in the constructivist learning environment, teachers direct students to question, create opportunities for them to develop independent problem-solving skills, and allow learners to take an active role (Chan, 2004). The constructivist learning environment requires an interactive / dialogue approach between teacher-student and student-student. In the constructivist learning environment, the teacher asks questions that are thought-provoking questions from a single correct answer, giving each student an opportunity in order to explain his reason with justification, and does not make a correct or incorrect assessment (Ecevit and Çakmakcı, 2017).

The learning environments based on the constructivist teaching approach produce sound and long-lasting learning as well as improve the higher-level cognitive skills of students. Therefore, teachers should take into consideration the learning environment (Fisher and Fraser, 1981; Simpson and Oliver, 1990; Taylor and Fraser; 1991; Taylor et. al., 1997).

Karadağ et. al. (2008) found that although the teachers participated in the study had a constructive learning-teaching approach, they could not manage to establish a constructivist learning environment in classrooms due to the following problems: insufficient teaching materials and tools in classrooms, crowded classrooms, time constraints, poor physical and financial status of schools, system-related drawbacks and unsupportive parents. On the other hand, Çınar et. al. (2007) argued that although teachers had a constructive learning-teaching approach, they still make use of conventional learning-teaching methods. Ersoy (2005) concluded that for teachers it is very difficult to give up following the teaching activities based conventional learning-teaching approach. In many studies, it has been determined that teachers are experiencing problems in constructivist learning environments (Yaşar et al., 2005, Selvi, 2006, Yücel et al., 2006).

In the study, it was found that the perceptions of the science teachers were higher than those of the classroom teachers in regard to learning the world, learning science, learning to learn, learning to communicate scientifically, and the approach towards the class. But this difference was not statistically significant. On the other hand, the classroom teachers were found to have higher perceptions than science teachers about learning to express his own views. However, this difference was not statistically significant either. Female teachers were found to have higher perceptions about learning the world, learning science, learning to express his own views, learning to communicate scientifically, and the approach towards the class. Male teachers, on the other hand, were found to have higher perceptions about learning to learn. However, these differences based on gender were not found to be statistically significant. Aydın et. al. (2012) found that the participants had higher mean scores for the dimensions of learning to express his own views and of learning the world and that the mean scores were lower for the dimensions of learning science and learning to learn. The reason for this finding seems to be that teachers do not have sufficient information about the nature of science as suggested by Lederman (2007).

In the study, it was also found that the teaching experience had an only significant effect on the perceptions about learning the world. Both the teaching experience and the field of teaching were

found to have significant effects on the dimensions of learning to learn and of learning to express his own views. Such differences were observed between teachers with a teaching experience of 6-10 years and those with teaching experience for more than 20 years. It can be suggested that those teachers with a teaching experience of more than 20 years are unfamiliar with the constructivist approach. For this reason, it is very important to provide in-service training seminars on the nature and teaching of science, the development of classroom teacher-student dialogues and the methodology/techniques/strategies based on research questioning for the teachers with years of vocational seniority.

As a result, it was determined that the teachers had more constructive teaching-learning attitudes in this research. At the same time, it was determined that there was no meaningful difference between the teachers' learning and learning perceptions and constructivist learning environment perceptions according to variables of age and sex, and statistically significant difference according to seniority year variable.

In spite of the fact that the science curriculums have proposed the constructivist learning approach since 2004, it can be stated that the goals of the program are not fully achieved due to the traditional understanding of teachers. For this reason, it is necessary to provide in-service and pre-service training that contribute to the professional development of the teachers in order to be successful in the updated science course teaching program.

This research was conducted with the classroom and science teachers who work in a certain region. This study with a quantitative method can be applied by supporting qualitative methods such as interviewing and observation. In this way, the depth analysis would be possible.

REFERENCES

Acat, B., Anılan, H., and Anagün, Ş. (2007). Yapılandırmacı öğrenme ortamlarının düzenlenmesinde karşılaşılan sorunlar ve çözüm önerileri [The problems encountered in the regulation of constructivist learning environment and solutions]. *VI.Ulusal Sınıf Öğretmenliği Eğitimi Sempozyumu.* Eskişehir: Anadolu Üniversitesi Eğitim Fakültesi,

Acat, M. B., Anılan, H., and Anagun, S. S. (2010). The problems encountered in designing constructivist learning environments in science education and practical suggestions. *TOJET: The Turkish Online Journal of Educational Technology, 9*(2), 212-220.

Anagün, S. S., Yalçinoğlu, P., and Ersoy, A. (2012). Sınıf öğretmenlerinin fen ve teknoloji dersi öğretme-öğrenme sürecine ilişkin inançlarının yapılandırmacılık açısından incelenmesi [An investigation of primary school teachers' beliefs on teaching-learning processes in science and technology course in terms of constructivism]. *Journal of Theoretical Educational Science/Kuramsal Eğitimbilim Dergisi, 5*(1), 1-16.

Aydın, S., Boz, Y., Sungur, S., and Çetin, G. (2012). Kimya öğretmen adaylarının yapılandırmacı öğrenme ortamı oluşturmaya yönelik tercihlerinin incelenmesi [Investigation of chemistry teachers candidates' preference for building a constructivist learning enviroment], *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 42*(1), 36-47.

Aydın, Ö., Tunca, N. ve Şahin, S. (2015). Fen bilgisi öğretmen adaylarının öğretme ve öğrenme anlayışlarının çeşitli değişkenler açısından incelenmesi. *Kastamonu Eğitim Dergisi, 23*(3), 1331-1346.

Aypay, A. (2011). The adaptation of the teaching-learning conceptions questionnaire and its relationships with epistemological beliefs. *Educational Sciences: Theory and Practice, 11*(1), 21-29.

Balcı, A. (2001). *Sosyal bilimlerde araştırma yöntem teknik ve ilkeler [Research methods in social science techniques and principles]*. Ankara: APegem, Yayınevi.

Baş, G. (2014). İlköğretim öğretmenlerinin öğrenme-öğretme anlayışlarının bazı değişkenler açısından değerlendirilmesi [Evaluation of elementary teachers' teaching-learning conceptions from some variables]. *Dicle Üniversitesi Ziya Gökalp Eğitim Fakültesi Dergisi, 22,* 18-30.

Baş, G., and Beyhan, Ö. (2013). Öğretmen adaylarının öğrenme-öğretme anlayışları ile öğrenci kontrol ideolojileri arasındaki ilişki [Correlation between pre-service teachers' teaching-learning conceptions and their student control ideologies]. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi,* Özel sayı(1), 14-26.

Bıkmaz, F. (2017). Öğretmen Adaylarının Öğretme-Öğrenme Anlayışları ve Bilimsel Epistemolojik İnançlarının Araştırılması: Boylamsal Bir Çalışma [Investigating the teaching and learning conceptions and scientific epistemological beliefs of pre-service teachers': a longitudinal study]. *Education and Science, 42*(189), 183-196.

Bıkmaz, F. H. (2011). Öğretmen adaylarının öğretme-öğrenme anlayışları ve bilimsel epistemolojik inançları [Teachers candidates' teaching-learning approach and epistemological beliefs.]. 5-8 Ekim *I.uluslararası eğitim programları ve öğretim kongresi*, Anadolu Üniversitesi Eğitim Fakültesi, Eskişehir.

Brooks J. G., and Books, M. G. (1999). The Courage to be Constructivist. *Educational Leadership, 57*(3) 18-24.

Chan, K. W. (2003). Hong Kong teacher education students' epistemological beliefs and approaches to learning. *Research in Education, 69,* 36-50.

Chan, K. W. (2004). Pre-service teachers' epistemological beliefs and conceptions about teaching and learning: Cultural implication for research in teacher education. *Australian Journal of Teacher Education, 29*(1), 1-13.

Chan, K. W., and Elliott, R. G. (2004). Relational analysis of personal epistemology and conceptions about teaching and learning. *Teaching and Teacher Education, 20,* 817-831.

Cheng, M. M. H., Chan, K-W., Tang, S. Y. F., and Cheng, A. Y. N. (2009). Pre-service teacher education students' epistemological beliefs and their conceptions of teaching. *Teaching and Teacher Education, 25*(2), 319-327.

Çınar, O., Teyfur, E., and Teyfur, M. (2006). İlköğretim okulu öğretmen ve yöneticilerinin yapılandırmacı eğitim yaklaşımı ve programı hakkındaki görüşleri [Primary school teachers and administators' views about constructivist education approach and programs]. *İnonu Üniversitesi Eğitim Fakultesi Dergisi, 7*(11), 47-64.

Dunlop, J. C., and Grabinger, R. S. (1996). Rich environments for the active learning in higher education. Wilson, G. B. (Ed.), *Constructing learning environments: Case studies in instructional design*. Englewood Cliffs, New Jersey: Educational Technology Publications.

Ecevit, T., and Çakmakcı, G. (2017). Kimya eğitiminde etkili söylem tekniklerinin kullanımı ve sınıf için söylem niteliğinin geliştirilmesi [The use of effective discourse techniques in chemistry education and the development of discourse quality for the classroom.]. M. Sözbilir, & A. Ayas (Ed.) KİMYA ÖĞRETİMİ: Öğretmen Eğitimcileri, Öğretmenler ve Öğretmen Adayları İçin İyi Uygulama Örnekleri [CHEMISTRY TEACHING: Good Practice Examples for Teacher Educators, Teachers and Teachers Candidates] (771-796). Ankara: Pegem Publishing (2nd Edition) Doi: 10.145279786053180746.

Engin, G., and Daşdemir, İ. (2015). Sınıf öğretmenlerinin öğretme ve öğrenme anlayışlarının çeşitli değişkenler açısından incelenmesi [Evaluation of primary school teachers' teaching-learning conceptions with regards to different variables]. *International Journal of Social Science, 33***,** 425-432.

Eren, A. (2009). Examining the teacher efficacy and achievement goals as predictors of Turkish student teachers' conceptions about teaching and learning. *Australian Journal of Teacher Education, 34*(1), 69-87.

Ersoy, A. (2005). İlköğretim bilgisayar dersindeki sınıf yerleşim düzeni ve öğretmen rolünün yapılandırmacı öğrenmeye göre değerlendirilmesi [Evaluation of classroom setting and teachers' role in computer course in elementary education in terms of constructivist learning principles]. *The Turkish Online Journal of Educational Technology, 4*(4), 170-181.

Eryaman, M. Y. (2007). From reflective practice to practical wisdom: Toward a post-foundational teacher education. *International Journal of Progressive Education, 3*(1), 87-107.

Fisher, D. L., and Fraser, B. J. (1981). Validity and use of the my class inventory. *Science Education, 65*(2), 145-156.

Fraenkel, J. R., and Wallen, N. E. (1993). *How to design and evaluate research in education* (Vol. 7). New York: McGraw-Hill.

Hewson, P. W. (1981). A conceptual change approach to learning science. *European Journal of Science Education, 3*(4), 383-396.

Karadağ, E., Deniz, S., Korkmaz, T., and Deniz, G. (2008).Yapılandırmacı öğrenme yaklaşımı: Sınıf öğretmenleri görüşleri kapsamında bir araştırma [Constructivist learning approach: a research on the scope of views of class teachers]. *Uludağ Universitesi Eğitim Fakultesi Dergisi, 21*(2), 383-402.

Karamustafaoğlu, O., Bayar, A., and Kaya, M. (2014). An investigation of science teachers' teaching methods and techniques: Amasya case. *Journal of Theoretical Educational Science/ Kuramsal Eğitimbilim Dergisi*, 7(4), 436-462.

Karasar, N. (2005). *Bilimsel araştırma yöntemi [Scientific research method]* (15. baskı). Ankara: Nobel Yayın Dağıtım.

Lederman, N.G (2007). *Nature of Science: Past, Present and Future.* In S.K Abell, and N.G. Lederman (Eds), Handbook of Research on Science Education. (pp.831-879). New Jersey: Lawrence Erlbaum Associates.

Ministry of National Education [MNE] (2013). *İlköğretim kurumları (ilkokullar ve ortaokullar) fen bilimleri dersi (3, 4, 5, 6, 7 ve 8. Sınıflar) öğretim programı.* [Science course curriculum]. Ankara: Talim ve Terbiye Kurulu Başkanlığı.

Ministry of National Education [MNE] (2018). *Fen bilimleri dersi öğretim programı. (ilkokul ve Ortaokullar 3, 4, 5, 6, 7 ve 8)* [Science course curriculum]. Ankara: Talim ve Terbiye Kurulu Başkanlığı.

Ocak, G., Ocak, İ., and Kalender, D. (2017). Öğretmenlerin öz-yeterlik algıları ile öğretme-öğrenme anlayışları arasındaki ilişkinin incelenmesi [Correlation Between Teachers' Self-Efficacy And Their Teaching-Learning Conceptions]. *Kastamonu Üniversitesi Eğitim Fakültesi Dergisi, 25(*5), 1851-1864.

Oğuz, A. (2011). Öğretmen adaylarının demokratik değerleri ile öğretme ve öğrenme anlayışları [Pre-service teachers' democratic values and their understanding of teaching and learning]. *Değerler Eğitimi Dergisi, 9*(22), 139-160.

Özdemir, M., and Kaptan, F. (2013). Sınıf öğretmeni adaylarının bilimsel süreç becerileri ve fen öğretimine yönelik tutumlarının incelenmesi [An investigation of pre-service primary teachers' science process skills and attitude toward science education]. *Kara Elmas Journal of Educational Science, 1,* 62-75.

Pallant, J. (2005). *SPSS Survival manual: A step by step guide to data analysis using SPSS for windows.* Australia: Australian Copyright.

Papanastasiou, C. (2002). School, teaching and family influence on student attitudes toward science: based on TIMSS data for Cyprus, *Studies in Educational Evaluation*, *28*, 71-86.

Posner, G.J., Strike, K.A., Hewson, P.W and Gertzog, W.A. (1982). Accommodation of a scientific conception: Toward a theory conceptual change, Science Education, *66.* 211-227.

Riedler, M. & Eryaman M.Y. (2016). Complexity, Diversity and Ambiguity in Teaching and Teacher Education: Practical Wisdom, Pedagogical Fitness and Tact of Teaching. *International Journal of Progressive Education. 12*(3): 172-186

Şahin, S., and Yılmaz, H. (2011). A confirmatory factor analysis of the teaching and learning conceptions questionnaire (TLCQ). *Journal of Instructional Psychology*, *38*(3), 194-200.

Şaşan, H. H. (2002). Yapılandırmacı öğrenme [Constructivist learning]. *Yaşadıkça Eğitim*, *74-75*, 49-52.

Schunk, D. H. (2008). *Learning theories: An educational perspective*. (5th ed.). Upper Saddle River, New Jersey: Pearson Education, Inc.

Scott, P. H., Mortimer, E. F., and 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.

Selvi, K. (2006). *Evaluation of primary education curricula based on the opinions of classroom teachers,* Muğla: XV. The Congress of National Educational Sciences, Muğla University, September 13-15, 2006.

Simpson, R. D., and Oliver, J.S. (1990). A summary of major influences on atttitude toward and achievement in science among adolescent student. *Science Education*. *74*, 1-18.

Tabachnick, B. G., and Fidell, L. S. (2007). *Using multivariate statistics*. Boston, Pearson Education, Inc.

Taylor, P. C., and Fraser, B. J. (1991, April). CLES: An instrument for assessing constructivist learning environments. In *annual meeting of the National Association for Research in Science Teaching, Lake Geneva, WI*.

Taylor, P.C., Fraser, B. J., and Fisher, D. L. (1997). Monitoring constructivist classroom learning environments. *International Journal of Education Research, 27*, 293-302.

Yaşar, Ş., Gültekin, M., Türkkan, B., Yıldız, N., and Girmen, P. (2005). *Yeni ilköğretim programlarının uygulanmasına ilişkin sınıf öğretmenlerinin hazırbulunuşluk düzeylerinin ve eğitim gereksinimlerinin belirlenmesi [Determination of readiness levels and educational requirements of primary teachers regarding the implementation of new primary education programs]*. Yeni İlköğretim programlarını değerlendirme sempozyumu, 51-63.

Yıldırım, A., and Şimşek, H. (2004). *Nitel araştırma yöntemleri [Qualitative research methods]*. Ankara: Seçkin Yayınları

Yücel, C., Karaman, M. K., Batur, Z., Başer, A. and Karataş, A. (2006). *Teacher opinions about the new primary education programme and evaluation of the programme,* Proceedings of National Educational Sciences Congress, Vol:15