Natural Sciences Teachers' Skills of Managing the Constructivist Learning Environment

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Abstract
The quality of education and instruction is related to effective execution of educational and instructional activities and efficiency of these activities is related to how the class is managed. Considered to be the manager of the classroom processes and program, teachers are expected to effectively direct and manage various material and human resources for the accomplishment of the goals. The purpose of the current study employing survey method is to determine the effect of gender, the type of the faculty graduated and length of service on teachers' skills of managing the constructivist learning environment. The sampling of the study consists of 85 Life Sciences, Physics, Chemistry and Biology teachers working in schools located in the city of Muğla in the second term of 2014-2015 school year. As a data collection tool, The Scale of Management Skills of The Constructivist Learning Environment (SMSCLE) developed by Yıldırım (2012) was used. The teachers' skills of managing constructivist learning environments were examined through frequencies and percentages, whether these skills vary depending on gender and the type of the faculty graduated was investigated with t-test and whether these skills vary depending on their length of service was investigated through one-way variance analysis. At the end of the study, it was concluded that the teachers' skills of managing the constructivist learning environment are high and gender and the type of the faculty graduated do not significantly affect their skills. Yet, their managing skills vary significantly depending on their length of service

Keywords: Classroom Management, Variance Analysis, Science Teachers, Constructivist Learning Environment**,** gender

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Introduction

Education means individuals' acquisition of information, skills and conceptions required for them to take their place in societal life and helping them inside or outside the school to develop their personalities (TDK, 2015). When the literature is reviewed, it is seen that there are different definitions of the term of education; however, there is an agreement among all these definitions that education is a unity of activities aiming to change behaviors or form new behaviors at desired direction (Başar, 1999). The quality of education and instruction is related to effective execution of educational and instructional activities. The efficiency of educational and instructional activities is related to how the classroom is managed. Arrangement of the learning environment and direction of the students through effective management of it are viewed to be the responsibility of teachers (Balcı, 1993). Ways of acquiring and processing information by humans have always attracted the interest of scientists; thus, many different opinions have been proposed (Schunk, 2008). One of the most important theories trying to explain learning process is constructivist learning theory (Brooks & Brooks, 1999; Eryaman, 2007). Constructivist learning maintains that individuals construct newly acquired information by adding it to their prior information (Jones and Brader-Araje, 2002; Eryaman & Genc, 2010). Therefore, mean assignment in this learning system does not occur by means of direct learning rather by means of real life experiences (Yurdakul, 2004) or content-based experiences of the learner (Biggs, 1996). Therefore, the individual is seen as an effective person responsible for his/her own learning and selecting and processing the most suitable for himself/herself (Abbott and Ryan, 1999). Akgün (2005) stresses that instruction conducted on the basis of constructivist approaches will have some effects on interrelated concepts such as school management and classroom discipline because students developing democratic and multiple viewpoints, well-educated and having problem solving skills will turn out to be students who can defend their opinions and rights and get organized. In constructivist approach, teacher and student roles are different from those in the traditional approaches (Çandar and Şahin, 2013). Classroom management can be seen as a process of setting the order as a whole and eliminating any disruption to the order (Burden, 1995). According to Çandar and Şahin (2013) in instruction given on the basis of constructivist approach, the teacher mostly serves the roles of arranging the learning environment and counseling, thus feels to need to adopt classroom management practices different from the ones followed in traditional education. This new approach requires teachers to change their roles. For students to scientifically analyze events and to be individuals wondering, inquiring and questioning, science education is of great importance; thus, science teachers should have some qualifications. According to Akpınar and Ergin (2005), a teacher adopting constructivist approach;

1. Considers individual differences of students and encourages them to be successful through his/her supportive behaviors and offering them opportunities to express their opinions during the process of education and instruction.

2. Helps students to make direct observations so that they can gain permanent experiences by using interactive instructional materials as science subjects are closely related to close environment of students.

3. Uses a consistent and comprehensible language during the process of information exchange so that he/she can prevent possible misconceptions.

4. Prepares learning environments allowing students to demonstrate their creativity by drawing on the scientific terminology.

5. Helps students to acquire permanent information by leading them in the discovery of the information.

6. Establishes the setting needed for the realization of learning by enabling students to be in good interaction with their environment

7. Encourages students to make research by asking questions allowing them to use their acquired information.

8. Gives time to students to understand the question he/she has asked and then offers proper feedback.

9. Focuses on process rather than product while evaluating students.

10. Creates inter-disciplinary interaction by developing annual plans together with other teachers and implements course plans flexibly.

When the qualities of the teachers adopting constructivist approach are examined, it is clearly seen that they are different from the teachers adopting classroom management approaches used in traditional educational environments. Students can be more active and successful as a result of classroom management behaviors of teachers and thus, classes can be more productive (Kiraz and Omağ, 2013). Science teachers are the implementers of all the reform works conducted in the field of science. Evaluation of science teachers' perception of classroom management skills is of great importance for the development of efficient science education reform programs. Therefore, both the Ministry of National Education and universities organize trainings for teachers about the effective use of constructivist approach and classroom strategies and techniques to strengthen their classroom practices. Thus, it is believed that taking the opinions of teachers about the effectiveness of their classroom management in instructional settings where constructivist approach is employed is important. When the literature was reviewed, it was found that while female teachers most prefer to use the classroom management profile of "the one appreciated", male teachers most prefer "authoritarian" classroom management profile (Ekici, Aluçdibi and Öztürk; 2012). In environments where constructivist approach which has been quite popular in the last ten years in Turkey is adopted, it has been wondered whether gender of teachers leads to significant differences in classroom management practices. Moreover, when the literature is reviewed, it is seen that there is a positive correlation between the length of professional service and classroom management. Particularly, within the first years of professional career, teachers may be confronted with serious problems in classroom management (Taşdan and Kantos, 2007). Such teachers, as a result of failure they have experienced in classroom management, feel stressed and may think that they are unsuccessful in the profession of teaching (Sarıtaş, 2003). There is not enough research investigating whether there are significant differences between the classroom management practices of the science teachers trained according to traditional approach and those of the science teachers trained in line with constructivist approach following the adoption of constructivist approach in science education. Literature also reveals that there are significant differences between the classroom management practices of the teachers having graduated from science faculties and those of the teachers having graduated from education faculties. With the adoption of constructivist approach, the number of studies focusing on the type of the graduated faculty has decreased. Though there are some studies (Ada, 2000; Çınar, O., Temel, A., Beden, N. and Göçgen, S., 2004; Karaçalı, 2006; Çetin, 2013; Atıcı, 2014; Eker, 2014) looking at the effects of variables such as physical conditions of the classroom, classroom population and self-efficacy beliefs of teachers on classroom management, there is no such study dealing with the effects of these variables on teachers' skills of managing constructivist classroom environments; thus, future research may look at this issue.

The purpose of the current study is to investigate the effects of gender, whether having graduated from a science faculty or an education faculty and teachers' length of professional service on their skills of managing a constructivist classroom environment. The current study is believed to make valuable contributions to literature, as it will explore the extent to which constructivist approach-based activities are implemented in the class, to what extent teachers instruct in compliance with the principles of constructivist approach and what kind of learning process students are undergoing in the class.

Hence, the goal of the current study was set to determine the effects of gender, the type of the faculty graduated and length of service on their skills of managing the constructivist learning environment.

For this purpose, answers were sought to the following sub-questions:

1. What is the distribution of natural sciences teachers according to their skill level of managing the constructivist learning environment?

2. Do the natural sciences teachers' skills of managing the constructivist learning environment vary significantly depending on;

    a) gender,

    b) the type of the faculty graduated,

    c) length of service?

Method

In the determination of the teachers' skills of managing the constructivist learning environment, survey method was employed. This method is a research model aiming to describe a state as it is or was (Karasar, 2006).

Sampling

The sampling of the current study constructed by using purposive sampling method, one of the non-random sampling selection methods, consists of totally 85 teachers selected from among the Life Sciences teachers working at secondary schools in Muğla and Physics, Chemistry and Biology teachers working at high schools in Muğla in the second term of 2014-2015 school year.

Data Collection Instruments

In the current study, a personal information form developed by the researcher to elicit the demographic features (gender, the type of the faculty graduated and length of service) of the participants and The Scale of Management Skills of the Constructivist Learning Environment (SMSCLE) developed by Yıldırım (2012) were used as data collection instruments. Developed by Yıldırım (2012), SMSCLE is a 33-item five-point Likert-type scale (Never, Rarely, Sometimes, Often, Always). The score range of the scale is between 33 and 165. The levels of the skills of managing constructive learning environment were determined to be low, medium and high and the range interval was divided into the number of groups and thus, score intervals were determined. In this way, the level of the students getting a score ranging from 33 to 76 is set to be low, the level of the students getting a score ranging from 77 to 120 is set to be medium and the level of the students getting a score ranging from 121 to 165 is set to be high. The

internal consistency coefficient of the original scale is .94. The reliability coefficient calculated on the basis of the data of the current study was also found to be .94.

Data Analysis

The data collected through the personal information form and SMSCLE were analyzed through SPSS 20.00 program package. Whether the teachers' management skills vary depending on gender and the type of the faculty graduated was investigated with t-test and whether these skills vary depending on their length of service was investigated through one-way variance analysis (ANOVA). The lowest score to be taken from the 33-item scale is 33 and the highest score is 165 and all the items are positive and scored as follows: Never: 1, Rarely: 2, Sometimes: 3, Often: 4, Always: 5.

Findings

In this section, the collected data are analyzed with appropriate statistical techniques and the findings obtained are interpreted by tabulating them.

Findings related to first sub-problem

The first sub-problem of the study aims to determine the teachers' skills of managing the constructivist learning environment. In this regard, frequencies and percentages calculated for the teachers' skills of managing the constructivist learning environment are presented in Table 1.

Table 1. The teachers' skill levels of managing the constructivist learning environment

Medium				High			
N	%	$\overline{X}$	S	N	%	$\overline{X}$	S
4	4.7	111.50	4.04	81	95.3	143.65	12.76

When Table 1 is examined, it is seen that 95.30% of the participants have high level of constructivist learning environment management skills and only 4.70% have medium level of these skills, their arithmetic mean is 143.65 and standard deviation is 12.76. None of the teachers was found to have low level of constructivist learning environment management skills.

Findings related to the second sub-problem

The second sub-problem of the study is related to whether the teachers' classroom management skills vary significantly depending on gender. In this connection, t-test results for the teachers' scores taken from SMSCLE in relation to gender are presented in Table 2.

Table 2. t-test results for the teachers' scores taken from SMSCLE in relation to gender

Gender	N	$\bar{X}$	S	t	p
Male	41	135.46	12.13		
				-4.68	0.23
Female	44	148.36	13.30		

As can be seen in Table 2, 41 of the teachers are males and 44 are females. The teachers' constructivist learning environment management skills do not vary significantly depending on gender $[t_{(83)} = -4.68, p>.05]$.

Findings related to the third sub-problem

In order to determine whether the teachers' constructivist learning environment management skills vary significantly depending on the type of the faculty graduated, independent samples t-test was conducted and the results are presented in Table 3.

Table 3. T-test results for the teachers' cognitive learning environment management skills in relation to the type of the faculty graduated

Type of the faculty graduated	N	$\bar{X}$	S	T	p
Education faculty	61	144.22	12.97		
				2.01	0.21
Science faculty	24	136.83	16.12		

As can be seen in Table 3, 61 of the teachers are the graduates of education faculty and 24 are the graduates of science faculty. The teachers' cognitive learning environment management skills do not vary significantly depending on the type of the faculty graduated $[t_{(83)} = 2.01, p>.05]$.

Findings related to the fourth sub-problem

In order to determine whether the teachers' constructivist learning environment management skills vary significantly depending length of service, one-way variance analysis was carried out and the results are presented in Tables 4 and 5.

Table 4. Arithmetic means and standard deviations of the scores taken by the teachers from the scale of skills of managing the constructivist learning environment in relation to length of service

Length of service	N	$\overline{X}$	S
1-5 years	7	150.86	13.13
6-10 years	18	132.89	12.64
11-15 years	22	142.10	15.91
16-20 years	20	138.40	11.28
21 years and more	18	152.22	8.97

In Table 4, it is seen that length of service of 7 teachers is 1-5 years, that of 18 teachers is 6-10 years, that of 22 is 11-15 years, that of 20 is 16-20 years and that of 18 is 21 years or more. That is, majority of the teachers have been working as a teacher for between 11 and 15 years. Arithmetic means show that the teachers having been working for 21 years or more have higher constructivist learning environment management skill scores than the teachers having shorter length of service ($\overline{X}$ =152.22), (S=8.97). The teachers having been working for 6-10 years have the lowest mean score ($\overline{X}$ =132.89), (S=12.64). The results of the variance analysis conducted to test whether the differences between the arithmetic means are significant are presented in Table 5.

Table 5. ANOVA results for the teachers' constructivist learning environment management skills in relation to length of service

Source of the variance	Sum of squares	Sd	Mean of squares	F	P	Significant difference
Between-groups	4181.94	4	1054.49			1-5 years - 6-10 years,
Within-groups	12850.36	80	160.63	6.51	.000	6-10 years - 21 years or more,
Total	17032.31	84	-			16-21 years and 21 years and more

[$F_{(4-80)}$= 6.51, p< .05]

The results presented in Table 4 show that there is a significant correlation between the natural sciences teachers' constructivist learning environment management skill scores and their length of service [$F_{(4-80)}$= 6.51, p< .05]. Namely, the teachers' constructivist learning environment skills vary significantly

depending on their length of service. In order to find the source of this difference, Scheffe test was conducted and the results revealed that the constructivist learning environment management skill level of the teachers having been working for 1-5 years ($\overline{X}$=150.86) is higher than that of the teachers having been working for 6-10 years ($\overline{X}$=132.89) and the constructivist learning environment skill level of the teachers having been working for 21 years or more ($\overline{X}$=152.22) is higher than that of the teachers having been working for 6-10 years ($\overline{X}$=132.89) and that of the teachers having been working for 16-21 year ($\overline{X}$=138.40).

Discussion, Results and Suggestions

The findings of the present study conducted to determine the effect of gender, the type of the faculty graduated and length of service on natural sciences teachers' constructivist learning environment management skills can be summarized as follows:

It was concluded that the teachers' constructivist learning environment skill level is high. When the relevant literature is examined, it is seen that Turan and Erden (2010) conducted a study with the participation of 411 classroom teachers and reported that the classroom teachers' constructivist learning environment management skills are at good level. According to Özenç and Doğan (2007), the classroom teachers view themselves adequate in terms of teaching competencies expected in a program developed in line with constructivist approach. Aldrich and Thomas (2002), Yılmaz (2006), Ağlagül (2009), Yıldırım (2012), Çınar, Teyfur and Teyfur (2006) also reported similar findings in terms of the construction and organization of constructivist learning environments. However, Kaloç (2006) stated that elementary school inspectors reported that elementary school teachers have medium level of teaching competencies. Arslan, Orhan and Kırbaş (2010) found that school directors believe that Turkish language teachers can create low level of democracy in class as they sometimes have to resort to shouting and coercion. Dağlı and Sünkür (2012) aimed to determine the elementary school teachers' perception of their in-class behaviors on the basis of inspection reports and found that their perception is "sometimes". These results show that there is a difference between how teachers see themselves in the constructivist environment and how they are perceived.

It was found that the teachers' constructivist learning environment management skills do not significantly vary depending on gender and the type of the faculty graduated. Özdemir (2007), Özenç and Doğan (2007), Turan and Erden (2010) also reported that gender does not significantly affect teacher competencies within constructivist approach.

Özgan, Yiğit, Aydın and Küllük (2011) concluded that the type of the faculty graduated does not significantly affect teachers' learning environment management skills. However, Yıldırım (2012) conducted a study by using SMSCLE and concluded that the type of the faculty graduated leads to significant differences in sub-dimensions. Özenç and Doğan (2007) reported that the classroom teachers' constructivist approach competency levels vary significantly depending on the type of the faculty graduated in favor of the graduates of education faculty. Dündar (2008) found that the teachers having graduated from any faculty different from education faculty are more constructivist than the teachers having graduated the classroom teacher education departments of education faculties. These finding concur with the findings of the present study.

It was also found that the constructivist learning environment management skill level of the teachers having been working for 1-5 years is higher than that of the teachers having been working for 6-10 years and the constructivist learning environment skill level of the teachers having been working for

21 years or more is higher than that of the teachers having been working for 6-10 years and that of the teachers having been working for 16-21 years. The findings obtained show us that the length of professional service has positive effect on their classroom management skills. In literature there are some studies reporting similar findings. Uç (2013) stated that there are differences between the classroom management skills of teachers working for 20 years or more and teachers working for 5-10 years. Yıldırım (2012) found that the teachers' constructivist learning environment skills vary significantly depending length of service in favor the teachers having been working for 16 years or more. Özenç and Doğan (2007) also reported a significant difference between the teachers' constructivist approach competencies depending on length of service in favor of the teachers having been working for 21 years or more. Dağlı and Sünkür (2012) found on the basis of the perceptions of the elementary school inspectors that there is a significant difference between the classroom behaviors of the experienced teachers and novice teachers. Akın (2006) conducted a study on 77 teachers and found that classroom management skill levels of teachers working for 21-30 years are lower than those of the teachers working for 1- 5 years and 1-10 years. Thus, it is seen that classroom management skill levels of teachers working for 6-10 years are higher than those of teachers working for 21-30 years. While Özmen (2003); Korkut and Babaoğlan, (2010); Turan and Erden (2010) reported similar findings in their studies, Yılmaz (2006) stated that length of service does not lead to a significant difference between the teachers' constructivist learning environment management skills. In a similar manner, Yalçınkaya and Tonbul (2002) determined that classroom management skills vary significantly depending on the length of service. The findings of these studies do not concur with the finding of the current study in terms of the length of service variable.

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

1. Extending the research into different branches and regions can contribute to more in-depth analysis of the issue.

2. In-service trainings can be organized to improve novice teachers' constructivist learning environment management skills.

3. Research to be conducted with bigger samplings by using qualitative research methods can make important contributions to the literature.

In recent Science and Technology programs implemented in Turkey, it is recommended that teaching strategies should be determined by means of an approach making students active and putting them into center and learning environments should be designed in compliance with this approach (The Ministry of National Education, [MEB], 2005). Teachers are expected to design activities in line with the content of science and technology course and to provide guidance to their students during learning-teaching activities. Therefore, both by The Ministry of National Education and universities, training programs should be offered to teachers to promote the effective use of constructivist approach and to improve their competencies to use classroom management strategies and techniques. A science teacher equipped with the skills required for the management of a constructivist learning environment can use educational technologies effectively, consider individual differences, promote students' creativity and thus, can provide opportunities for each student to learn equally and make the acquired information more permanent by encouraging students to discover and increase mutual interaction among students so that they can be more socialized. With the contributions of teachers having high level of classroom management skills, students will be more active in class and enjoy a fruitful classroom environment and in this way, students can increase their academic achievement and develop positive attitudes towards science classes

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