Predicting Students' Self-Efficacy towards Learning Science by Constructivist Learning Environment Perceptions[1]

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Abstract: This study investigated predictive effect of middle school students' perceptions of constructivist science learning environment on their self-efficacy towards learning science. 663 seventh grade students from 15 public schools in Erzurum participated in the study. Self-report questionnaires were used to collect data in spring semester of 2016-2017 academic year. Multiple linear regression analysis showed that all perceived constructivist science learning environment features (i.e., personal relevance, uncertainity, critical voice, shared control, and student negotiation) statistically significantly and positively predict students' efficacy beliefs in science. Students' constructivist learning environment perceptions accounted for 56.5% of the variance in their self-efficacy beliefs. These findings indicated that when students take active role in their learning, given opportunities for freely asking questions, participate in class discussions and share their knowledge with classmates, they are more likely to have higher confidence for learning science.

Keywords: Self-efficacy, constructivist learning environment, science education, middle school.
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Öğrencilerin Fen Öğrenmeye Yönelik Öz-Yeterliklerinin Yapılandırmacı Öğrenme Ortamı Algıları ile Yordanması

Özet: Bu çalışmada, öğrencilerin yapılandırmacı fen öğrenme ortamı algılarının, fen öğrenmeye yönelik öz-yeterlikleri üzerindeki yordayıcı etkisi araştırılmıştır. Çalışmaya Erzurum'daki 15 devlet okulundan 663 yedinci sınıf öğrencisi katılmıştır. Veriler 2016-2017 akademik yılının bahar döneminde ölçekler uygulanarak toplanmıştır. Çoklu doğrusal regresyon analizi, algılanan yapılandırmacı fen öğrenme ortamının tüm alt boyutlarının (Dünya'yı öğrenme, bilimi öğrenme, düşüncelerini ifade etmeyi öğrenme, öğrenmeyi öğrenme ve iletişim kurmayı öğrenme) öğrencilerin fen öğrenmeye yönelik öz-yeterlik inancını istatistiksel olarak anlamlı ve pozitif olarak yordadığını göstermiştir. Öğrencilerin yapılandırmacı öğrenme ortamı algıları, öz-yeterlik inançlarındaki varyansın %56.5'ini açıklamıştır. Bu bulgulara dayanarak, öğrencilerin kendi öğrenmelerinde aktif rol aldıkları, sınıfta öğrendikleri bilgilerle kendi deneyimlerini ilişkilendirebildikleri, rahatça soru sorma fırsatı buldukları, sınıf içi tartışmalara katıldıkları ve bilgilerini paylaşma şansına sahip oldukları sınıflarda, fen

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konularını öğrenme ve hatta zor olan fen problemlerini çözme konusunda daha fazla güven geliştirebildikleri söylenebilir.

Anahtar Kelimeler: Öz-yeterlik, yapılandırmacı öğrenme ortamı, fen eğitimi, ortaokul.

INTRODUCTION

In order to support students' learning, various theories have been put forward on how the learning environment should be. Among these theories, constructivist theory is defined as the process of associating new knowledge with previous knowledge by keeping the student's autonomy and self-awareness in the teacher's guidance on the frontline (Akpınar & Ergin, 2005; Bodner, 1986; Köseoğlu & Kavak, 2001; Palmer, 1999; Saban, 2000). In order to create a constructive classroom environment, contemporary teaching methods should be used instead of traditional teaching methods that lead children monotony (Akpınar & Ergin, 2005). In order to promote meaningful learning for the students, the classroom facilities, the teaching materials, and the curriculum must be revised in detail (Mayer, 1998). Since 2000, science curriculum in Turkey has adopted constructivist approach (Ministry of National Education, 2000; 2005; 2013; 2018).

Teachers have important tasks in creating a constructive classroom environment. The most important of these tasks is; without transferring knowledge directly to the student, helping them to make sense of new knowledge in their minds by doing. In addition, during the planning process of the course, the teacher should not decide on alone, but instead should decide with the students. When the decision is made together, the students are effectively included in the course. Social interaction and group work are highly emphasized. At the beginning of each topic, various activities are carried out in order to determine the level of the students' prior knowledge which help to ensure that the new information is internalized by the learners (Akpınar & Ergin, 2005).

The recent increase in studies on learning environments has been contributing to a better understanding of the importance of the quality of the learning environment. In many studies, it has been shown that perceptions of students' psychosocial characteristics of the learning environment are related to their various cognitive and affective learning outcomes (Fraser, 1998). For instance, in studies conducted using learning environment scales based on the constructivist approach, there was a positive relationship between constructivist learning environment aspects and learning-related cognitive and affective variables such as students' science achievement scores (Allen & Fraser, 2007; Pamuk, 2014; Snyder, 2005), motivation (Hafizoğlu, 2018), metacognition (Yilmaz-Tuzun & Topcu, 2010), and goal orientation (Yerdelen, 2013).

The quality of learning environment is also associated with students' self-efficacy beliefs (Lorsbach & Jinks, 1999). Self-efficacy is defined as "people's judgments of their capabilities to organize and execute courses of action required to attain designed types of performance" (Bandura,

1986, p. 391). Individuals' efficacy beliefs influence their motivation, thinking, and behaviors (Bandura, 1993). For instance, in order to complete a given task, efficacious individuals are more likely to expend more effort, be persistent, and deploy their attention to the requirements of the task (Bandura, 1986). Students' judgments of their capabilities for successfully achieving a particular task, that is self-efficacy, is an important indicator of academic achievement (Britner & Pajares, 2006; Multon, Brown, & Lent, 1991; Schunk & Pajares, 2005; Yerdelen, Sungur, & Klassen, 2012). Bandura's (1986) Social Cognitive Theory proposes that individuals function in the interaction of three factors which are personal, behavioral, and environmental factors. Accordingly, individuals' feelings are influenced from their social environment (Bandura, 1986).

As academic self-efficacy is a highly correlated variable with academic performance (Britner & Pajares, 2006; Schunk & Pajares, 2005), researchers have recently begun to investigate how it is influenced by the characteristics of learning environment. For example, Dorman (2001) conducted a study with 1055 mathematics class students in secondary schools in Australia with the purpose of providing a comprehensive assessment of the contemporary classroom environment by combining Constructivist Learning Environment Scale (CLES) (Taylor, Fraser & Fisher, 1997) and *What is Happening in This Class* (WIHIC) scale (Fraser, Fisher & McRobbie, 1996). As a result, he found that some features of constructivist learning environment are significantly and positively related (correlation coefficients ranged between .17 and .38) to academic self-efficacy. Dorman, Fisher and Waldrip (2006) also examined the relation of learning environment with self-efficacy in science and attitude towards science by using WIHIC scale. Bivariate correlation coefficients were found to be ranging from .11 to .53. Additionally, the results of Fast et al.'s (2010) study showed that the math self-efficacy levels of students who perceived classroom learning environments as more caring, challenging, and mastery oriented were higher than others. Although studies generally found positive associations between constructivist learning environment and self-efficacy, this research field in science education is relatively new in Turkey and only a few studies empirically examined these associations. For instance, Pamuk (2014) investigated the relationship among students' science achievement, perceptions of constructivist science learning environment, epistemological beliefs, self-regulation, and some characteristics of teachers. 137 science teachers and 3281 seventh grade students completed self-report questionnaires. In order to analyze two-level data (students and teacher level), the hierarchical linear modelling (HLM) analysis was conducted. The findings showed that perceptions of constructivist learning environment and sophisticated epistemological beliefs significantly and positively predicted science achievement. Regarding the relationships between learning environment features and self-efficacy beliefs, it was found that personal relevance, critical voice, shared control, and student negotiation were significant and positive predictors of self-efficacy beliefs while uncertainty was unrelated to self-efficacy beliefs. Additionally, critical voice aggregated in the class level was a significant and positive predictor of student' self-efficacy beliefs. In a similar

study, Yerdelen (2013) examined the predictors of 7th grade students' self-efficacy in learning science by using WIHIC. Data were gathered from 8198 students from 372 classrooms across Turkey. Results of HLM analysis showed positive and significant relationships between most of the subscales of learning environment and self-efficacy towards learning science. In another study, Alt (2015), measured the perceived constructivist pedagogical principles and academic self-efficacy of undergraduate students enrolled in the problem-based learning environment (PBL) and in a traditional instruction setting with the purpose of comparing the effect of different learning environments on students' self-efficacy. Results showed that students perceived learning environment of PBL class more constructivist oriented and have higher self-efficacy beliefs than those who received the traditional instruction. More recently, Hafızoğlu (2018) investigated the relationship among 7th grade students' (*n*= 922) perceptions of science learning environment, motivation, and achievement. Results of the path analysis showed that students' classroom learning environment perceptions was a significant predictor of science motivation which was constructed by some affective variables including self-efficacy in learning science.

To sum up, although findings of the aforementioned studies suggest that constructivist features of science learning environment may play a role in students' self-efficacy beliefs, there is a need for more studies to determine which aspects of the constructivist learning environments are influential on Turkish students' development of self-efficacy in learning science. Thus, in the present study, we aimed to investigate predictive effect of middle school students' perceptions of constructivist science learning environment on their self-efficacy beliefs towards science learning.

METHOD

This correlational study was designed to examine the relationships between perceived constructivist science learning environment and students' self-efficacy beliefs in science. For this purpose, self-report questionnaires were used for data collection in spring term of 2016-2017 academic year. Completion of questionnaires lasted for about half an hour.

Sample

663 seventh grade students enrolled in 15 middle schools located in three central district of Erzurum province in Turkey participated in this study. Permission was secured from the Ministry of Education for the administration of the surveys in these schools. The participants included 333 (50.3%) girls and 329 (49.7%) boys, while one of the participants did not identify gender. The mean age of the participants was 12.97 (*SD*= .49).

Instruments

The participants completed demographic information questionnaire, Constructivist Learning Environment Scale, and self-efficacy subscale of Motivated Strategies for Learning. In the demographic information questionnaire, students were asked about their gender and age.

Constructivist Learning Environment Scale was developed by Taylor, Fraser, and Fisher (1997). The scale consists of 20 items responded on a 5-point Likert type from 1= "almost never" to 5= "almost always". There are five subscales which are personal relevance (example item: "In this science class, I learn about the world inside and outside of school."), uncertainty of science (example item: "In this science class, I learn that science cannot always provide answers to problems"), student negotiation (example item: "In this science class, I ask other students to explain their ideas."), shared control (example item: "In this science class, I help the teacher to plan what I am going to learn"), and critical voice (example item: "In this science class, I learn better when I am allowed to question what or how I am being taught"). The scale was translated and adapted into Turkish by Yilmaz-Tuzun, Cakiroglu and Boone (2006). Later it was revised by Ozkal, Tekkaya, Cakiroglu, and Sungur (2009) who reported Cronbach's alpha coefficients for the subscales ranging from .57 to .74. In the present study, Cronbach's alpha coefficients for the subscales ranged from .67 to .75 (see Table 1) which were similar to values obtained in Turkish adaptation study.

Self-efficacy subscale was taken form Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich, Smith, Garcia, & McKeachie, 1991). There are 8 items in the self-efficacy subscale, an example item is "I'm certain I can understand the most difficult material presented in the readings for this course". Items of the scale are responded on a 7-point Likert from "1 = not at all true of me" to "7= very true of me". The scale was translated and adapted into Turkish by Sungur (2004) who conducted confirmatory factor analysis and reliability analysis. The Cronbach's alpha reliability coefficient was found to be .89 in that study. In the present study, Cronbach's alpha coefficient for self-efficacy subscale was calculated to be .91, indicating a high internal consistency.

RESULTS

Descriptive statistics for the components of perceived constructivist learning environment and self-efficacy were presented in Table 1. It was seen that, students perceived that their science learning environment contains constructivist features and reported high levels of self-efficacy for science learning.

Table 1. Descriptive statistics for the variables of the study

Variable	Min-Max	Mean	*SD*	Skewness	Kurtosis	Cronbach's alpha
Self-efficacy	1-7	5.19	1.36	-.73	.03	.91
Personal relevance	1-5	3.85	.87	-.83	.32	.70
Uncertainty	1-5	3.71	.87	-.69	.25	.70
Critical voice	1-5	3.80	.87	-.72	.14	.71
Shared control	1-5	3.43	1.00	-.43	-.47	.75
Student negotiation	1-5	3.54	.92	-.53	-.19	.67

A multiple linear regression analysis was conducted to examine the research question which focused on the association between students' perceived constructivist science learning environment (personal relevance, uncertainty, critical voice, shared control, and student negotiation) and their self-efficacy beliefs towards learning science. The analysis results (See Table 2) revealed that personal relevance (β= .26) statistically significantly and positively predict efficacy beliefs in science, which indicates that students who learn about the world outside of the class, relate new learnings with their experiences in real lives, and learn that science is a part of life both in and outside of the school is more likely to believe that they are capable of understanding complex science concepts, solving difficult questions, and getting high grades on examinations. Furthermore, student negotiation (β= .10) was also a significant predictor of the outcome variable. It positively predicted efficacy beliefs in science. This means that students who explain their thoughts to other students and who discuss about how to solve problems tended to be more efficacious in science. Critical voice (β= .23) was another statistically significant predictor of self-efficacy beliefs. Accordingly, students who freely question about what to learn and how to learn in science class, who seek for more explanations about complex activities, and inform teacher about obstacles for their learning are more likely to have higher levels of efficacy beliefs in science. Moreover, shared control (β= .10) significantly and positively predict efficacy beliefs in science. This indicates that students who help teachers about planning what to learn in class, evaluating what has been learnt, deciding on the activities which are more useful for their learning, and informing the teacher about the time they need to complete an activity reported higher levels of self-efficacy beliefs. Lastly, uncertainty (β= .20) was also a statistically significant predictor of self-efficacy. Namely, students who learn that scientific knowledge changes in time and scientific knowledge is influenced from cultural values of the scientists tended to be more efficacious in science. Therefore, middle school students' self-efficacy beliefs towards learning science was positively and significantly predicted by all of the 5 constructivist learning environment aspects. Personal relevance was found to be the best predictor of self-efficacy beliefs. Students' constructivist learning environment perceptions accounted for 56.5% of the variance in students' self-efficacy beliefs.

Table 2. Multiple linear regression analysis results predicting self-efficacy

	B	*SE* B	*β*	R^2
Self-efficacy				.57
Constant	.15	.18		
Personal relevance	.41	.07	.26***	
Uncertainty	.31	.07	.20***	
Critical voice	.36	.07	.23***	
Shared control	.13	.05	.10*	
Student negotiation	.15	.06	.10*	

*p< .05, **p< .01, ***p< .001

DISCUSSION and CONCLUSION

The findings of the study suggest that as students perceive their science learning environment as more constructivist, they are more likely to have higher levels of confidence for learning science. Based on these findings it can be said that in the classrooms where students join class discussions, illustrate their own experiences with the knowledge learnt in classroom, actively participate in learning processes, and share their knowledge with classmates and have opportunities for freely asking questions, they are more likely to develop higher confidence to learn science topics and solve even difficult science problems. The findings of several studies which have been conducted previously supported that self-efficacy for learning is one of the best indicators of academic achievement (e.g., Britner & Pajares, 2006; Schunk & Pajares, 2005; Yerdelen et al., 2012). Thus, creating such science learning environments seems important.in order to reach the goals of the Turkish science curriculum which is mainly based on the constructivist approach, Therefore, science teachers need to be informed about these important features of learning environment and how to create such a learning environment during either initial teacher training or in-service teacher training programs. Although various in-service trainings are organized to achieve this goal, these trainings are not sufficient according to some research findings. For example, Erdoğan (2007) found that in-service training programs were inadequate and that the constructive theory that was taught in the teaching methods course in teacher education programs was not effective in educating teachers who could use the theory effectively. The reason for this lack is, in particular, the fact that the philosophy of constructivist theory is not internalized by teachers and prospective teachers.

Although studies on the relationship between students' perceptions of constructivist learning environment and their self-efficacy beliefs are not extensive, in previous research, this relationship was mostly found to be positive and significant (Alt, 2015; Dorman, 2001; Dorman et al., 2006; Pamuk, 2014; Sungur & Gungoren, 2009). In this study, we found that the perception of the constructivist learning environment of students in the science class significantly and positively predict their self-efficacy. Therefore, the findings of the present study are compatible with the relevant

literature. The findings of the present study also support Bandura's (1993) assertion that individuals' self-efficacy beliefs are directly related to their learning environment and behaviors. On the other hand, Lorsbach and Jinks (1999) argued that students' perceptions of learning environment are influenced from their self-efficacy levels. Moreover, the researchers stated that teachers' knowledge of students' self-efficacy lead them to provide appropriate learning environment regarding their efficacy levels. Namely, highly efficacious students may benefit from more self-determined learning opportunities while less efficacious students are more likely to benefit from small and obvious incremental steps. For this reason, teachers who want to create a constructivist classroom environment should carefully consider their students' ability to cope with a specific task, select strategies and methods carefully, and relate externally defined conditions to the abilities of the students.

It is clear that according to the constructivist theory, learning is a process which occurs in the mind of the learner with the guidance of the teacher. Motivational factors such as self-efficacy play an important role in learning, and there are findings which indicate that self-efficacy mediates the relationship between perceived learning environment and achievement (e.g. Hafizoğlu, 2018; Sungur & Gungoren, 2009; Yerdelen, 2013). Findings from this study support that features of constructivist learning environment an important role in students' self-efficacy beliefs in science. In this regard, we suggest that science teachers need to integrate more constructive aspects in their classes. However, this study is limited with providing information about a causal relationship between constructivist learning environment and academic self-efficacy. Therefore, there is a need for longitudinal studies or experimental studies in which learning environment can be manipulated and its effect on the level of self-efficacy is measured or in the same constructivist learning environment, students' perceptions can be compared in different student groups who have high or low level of self-efficacy. When the previous studies are examined, it is seen that, generally, quantitative data have been used. For a more detailed examination of the relationship between learning environment and self-efficacy, qualitative data can be collected in the future studies. For example, in the current study, the constructivist learning environment was measured by students' perceptions through self-report questionnaires. In addition to this, observations can be made to investigate the self-efficacy of students in the classrooms in which the constructivist approach is applied.

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UZUN ÖZET

Giriş

Öğrencilerin öğrenmesini desteklemek için, öğrenme ortamının nasıl olması gerektiğine dair çeşitli teoriler öne sürülmüştür. Bu kuramlar arasında yapılandırmacı yaklaşım, öğretmenin rehberliğinde öğrencinin otonomisini ve öz-farkındalığını ön planda tutarak, yeni bilginin önceki bilgilerle ilişkilendirilmesi süreci olarak tanımlanmaktadır (Akpınar ve Ergin, 2005; Bodner, 1986; Köseoğlu ve Kavak, 2001). Yapılandırmacı sınıf ortamının oluşturulabilmesi için, çocukları tekdüzeliğe sürükleyen geleneksel öğretim yöntemleri yerine çağdaş öğretim yöntemlerinin kullanılması gerekmektedir (Akpınar ve Ergin, 2005). Öğrenme ortamları üzerine yapılan çalışmalarda son yıllarda gözlenen artış, öğrenme ortamının niteliklerinin önemini daha iyi anlaşılmasına her geçen gün katkı sağlamaktadır. Birçok araştırmada, öğrencilerin öğrenme ortamının psikosoyal özelliklerine yönelik algılarının onların çeşitli bilişsel ve duyuşsal öğrenme çıktıları ile ilişkili olduğu görülmektedir (Fraser, 1998). Yapılandırmacı yaklaşımı temel alan öğrenme ortamı ölçekleri kullanılarak yapılan çalışmalarda, yapılandırmacı öğrenme ortamı alt boyutları ile öğrencilerin fen başarı puanları (Allen ve Fraser, 2007; Pamuk, Sungur ve Öztekin, 2016; Snyder, 2005), motivasyon (Hafızoğlu, 20018) üstbiliş (Yilmaz-Tuzun ve Topcu, 2010) ve hedef yönelimi (Yerdelen, 2013) gibi öğrenmeyle ilgili bilişsel ve duyuşsal değişkenler arasında pozitif ilişki bulunmuştur. Öğrenme ortamının niteliği aynı zamanda öğrencilerin akademik öz-yeterlik inançları ile de ilişkilidir (Lorsbach ve Jinks, 1999).

Öz-yeterlik insanların belirli bir görevi başarabilmek için gerekli eylemleri organize etmek ve yürütmek için sahip oldukları yeteneklerine dair yargıları olarak tanımlanmaktadır (Bandura, 1986). Bireylerin yeterlik inançları, onların motivasyonlarını, düşüncelerini ve davranışlarını etkiler (Bandura, 1993). Öğrencilerin belirli bir görevi başarılı bir şekilde tamamlayabilme yetenekleri hakkındaki yargıları (öz-yeterlikleri), akademik başarının önemli bir göstergesidir (Britner ve Pajares, 2006; Multon, Brown ve Lent, 1991; Schunk ve Pajares, 2005; Yerdelen, Sungur ve Klassen, 2012). Akademik performans ile yüksek ilişkiye sahip bir değişken olduğu için akademik öz-yeterliğin (Britner ve Pajares, 2006; Schunk ve Pajares, 2005) de öğrenme ortamlarının özelliklerinden nasıl etkilendiğini araştırmak son günlerde araştırmacıların ilgisini çekmeye başlamıştır (Dorman (2001; Dorman, Fisher ve Waldrip, 2006; Yerdelen, 2013). Bu çalışmaların bulguları, fen öğrenme ortamının yapılandırmacı özelliklerinin öğrencilerin öz-yeterlik inançlarında rol oynayabileceğini düşündürse de

Türkiye'deki orta okul öğrencilerinin fen öğrenmeye yönelik öz-yeterliklerini geliştirme potansiyeline sahip olan yapılandırmacı öğrenme ortamının en etkili yönlerini belirlemek için daha fazla çalışmaya ihtiyaç vardır. Bu nedenle, bu araştırma, ortaokul öğrencilerinin yapılandırmacı fen öğrenme ortamı algılarının, fen öğrenmeye yönelik öz-yeterlik inançları üzerindeki yordayıcı etkilerini incelemeyi amaçlamıştır.

Yöntem

İlişkisel araştırma yönteminin kullanıldığı bu çalışmaya Erzurum ilinde bulunan 15 orta okuldan seçilen 663 yedinci sınıf öğrencisi katılmıştır. Katılımcıların 333'ü (50.3%) kız, 329'u (%49.7) erkektir ve bir öğrenci cinsiyetini belirtmemiştir. Öğrencilerin ortalama yaşı 12.97'dir (SS= .49). Araştırmada öğrencilerin yapılandırmacı sınıf ortamı algılarını ölçmek amacıyla Taylor, Fraser ve Fisher (1997) tarafından geliştirilen 20 maddelik Yapılandırmacı Öğrenme Ortamı Ölçeği'nin Türkçe versiyonu (Ozkal, Tekkaya, Cakiroglu ve Sungur, 2009) kullanılmıştır. Yapılandırmacı Öğrenme Ortamı Ölçeği, Dünya'yı öğrenme, bilimi öğrenme, düşüncelerini ifade etmeyi öğrenme, öğrenmeyi öğrenme ve iletişim kurmayı öğrenme adında 5 alt boyuttan oluşmaktadır ve bu çalışmada alt boyutlardan elde edilen puanlara ait Cronbach alfa değerleri .67 ile .75 arasında değişmiştir. Ayrıca, öğrencilerin öz-yeterlik düzeylerini ölçmek için Pintrich, Smith, Garcia ve McKeachie (1991) tarafından geliştirilen Öğrenmede Güdüsel Stratejiler Ölçeğinin Türkçe versiyonundan (Sungur, 2004) Öz-yeterlik alt boyutu kullanılmıştır. 8 maddeden oluşan bu ölçek için Cronbach alfa değeri .91 olarak hesaplanmıştır.

Bulgular

Verileri analiz amacıyla Çoklu Regresyon Analizi yapılmıştır. Elde edilen bulgular, fen öğrenme ortamının alt boyutları olan Dünya'yı öğrenme (β=.26), bilimi öğrenme (β=.20), düşüncelerini ifade etmeyi öğrenme (β=.23), öğrenmeyi öğrenme (β=.10) ve iletişim kurmayı öğrenme (β=.10) değişkenlerinin, öz-yeterlik değişkenini pozitif ve istatistiksel olarak anlamlı bir şekilde yordadığını göstermiştir. Bu alt boyutlar arasında, Dünya'yı öğrenme, öz-yeterliğin en iyi yordayıcısı olarak bulunmuştur. Öğrencilerin öz-yeterlik inançlarındaki varyansın %56.5'i yapılandırmacı öğrenme ortamı algılarıyla açıklanmıştır.

Tartışma

Araştırmanın bulguları, öğrencilerin fen öğrenme ortamlarını daha yapılandırmacı olarak algıladıkça, fen öğrenmeye yönelik daha yüksek öz-yeterlik inancı geliştirme eğilimine sahip olduğunu göstermektedir. Bandura'nın (1993) da belirtmiş olduğu gibi insanların sahip oldukları öz-yeterlik inancı, bulundukları öğrenme ortamı ve davranışları ile doğrudan ilgilidir. Bu bulgulara dayanarak, öğrencilerin kendi öğrenmelerinde aktif rol aldıkları, sınıfta öğrendikleri bilgilerle kendi deneyimlerini ilişkilendirebildikleri, rahatça soru sorma fırsatı buldukları, sınıf içi tartışmalara

katıldıkları ve bilgilerini paylaşma şansına sahip oldukları sınıflarda, fen konularını öğrenme ve hatta zor olan fen problemlerini çözme konusunda daha fazla güven geliştirebildikleri söylenebilir. Bu nedenle, ağırlıklı olarak yapılandırmacı öğrenme yaklaşımına dayanan ülkemizdeki fen eğitimi öğretim programının hedeflerine ulaşmak için, fen sınıflarında bu tür öğrenme ortamlarını oluşturmak önemli görünmektedir. Yapılandırmacı öğrenme ortamını sınıflarında uygulayabilen öğretmenler, öğrencilerinin belirli bir görevle başa çıkma becerilerini dikkate almalı, stratejileri ve yöntemleri dikkatli bir şekilde seçmeli, böylece dışsal olarak belirlenmiş koşulları öğrencilerin yetenekleri ile ilişkilendirmelidir. Bu nedenle, fen bilgisi öğretmenlerine, öğrenme ortamının bu özellikleri ve böyle bir ortamın nasıl oluşturulacağı hakkında bilgi sahibi olmaları öğretmen eğitimi veya hizmet içi öğretmen eğitimi programları sırasında sağlanabilir.