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Examine middle school students' constructivist environment perceptions in Turkey: School location and class size

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ABSTRACT

This study aims to examine the middle school students' perceptions of the classroom learning environment in the science course in Turkey in terms of school location and class size. In the study the Assessing of Constructivist Learning Environment (ACLE) questionnaire was utilized to map students' perceptions of the classroom learning environment. The sample included 1882 students from Grades 6-8 randomly selected twenty schools in a northern province in Turkey. Data analysis revealed that there were significant differences between the perceptions of students from rural/urban schools and small/large classes. More specifically, students in small classes and rural schools reported their classroom learning environments more positively than those who were in large classes and urban schools in dimensions of thought provoking, collaboration, life relevance, concurrent learning and assessment, and bringing different viewpoints. Implications and future directions were discussed.

Keywords: Class size, constructivism, classroom learning environment, school location.

INTRODUCTION

The classroom learning environment is defined as a social atmosphere in which learning occurs (Fraser, 2007). Students' achievements and behaviors are influenced by factors in the classroom (Khalil & Saar, 2009). In such a learning environment that every psychological and sociological learning tool is important in learning process, it is undeniable that learners' reflection to their teaching-learning environment can be an indicator of student outcomes at schools. Moreover, Fraser (2014) underscores because students spend nearly 20,000 hours in classrooms until graduating from colleges, students' feelings on classroom learning environments influence educational desired outcomes and thus, the research addressing learning environments should be taken as considerable of importance. Therefore, in last decades classroom learning environment research on teaching-learning has drawn attentions of many researchers in science education (Fraser, 2012; Khalil & Saar, 2009; Liu, 2010).

Along with recent changes on our understanding of how learning occurs, educational reforms in science curriculum, which are dominated by constructivist paradigm, have been

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recently launched in many countries including Turkey (Cil, 2015; Taber, 2008). Apart from the behaviourism-, learning occurs by solely transmitting knowledge from one to another one- the constructivist paradigm pays attentions into the connections of new knowledge with leaners' experience in the learning process. Additionally, the constructivist paradigm highlights the importance of cognitive and environmental factors in the learning process. Because the learning occurs in classrooms, the classroom learning environments should be designed accordingly. Thus, the particular focus of this study was given on examining students' perceptions of classroom learning environment in terms of the constructivist paradigm. Bektas and Taber (2009) state that the constructivist classrooms are where the learners work together, present their ideas, take active roles and are assessed in the learning process. Addition to these, rather than transmitting new knowledge, constructivist classrooms should promote students to evaluate their existing knowledge with new one (Evrekli, Inel, Balim, & Kesercioglu, 2009). Therefore, in order to cultivate the meaningful learning in science classrooms, it is important to investigate to what extent students evaluate their learning environment as constructivist and factors that might influence on their perceptions of the classroom learning environment.

Research has associated students' perceptions of the classroom learning environment with a broad range of variables in educational research including students' motivation, attitudes and achievement, teachers' job satisfaction, and so on. The classroom learning environment should motivate students towards learning science, and be designed to help them pay more attention scientific phenomena. Research has demonstrated that students' perceptions of classroom learning environments are positively related to attitudes towards science (den Brok, Telli, Cakiroglu, Taconis, & Tekkaya, 2010), motivation (Könings, Brand-Gruwel, & van Merriënboer, 2011), and achievement goal orientation (Ghanizadeh, & Jahedizadeh, 2015). Furthermore, it positively influences teachers' job satisfaction with their profession (Tillman & Tillman, 2008). For example, Ozkal, Tekkaya, Cakiroglu, and Sungur (2009) studied the influence of students' perceptions of the classroom learning environment (personal relevance, uncertainty, critical voice, shared control, and student negotiation) on their epistemological beliefs (tentative and fixed beliefs) and learning strategies in science. A total of 1152 eight grade students participated in their study. Ozkal et al found that all dimensions of students' perceptions of the classroom learning environment directly influenced students' tentative and fixed beliefs in science (e.g., $\beta = 0.12$, $p<0.01$ for critical voice and tentative beliefs). Furthermore, students' perceptions of the classroom learning environments perceptions directly and indirectly contributed to their learning approach (e.g., $\beta = 0.12$, $p< 0.01$ for both student negotiation and learning strategies). Their study demonstrated that how students felt about their classroom learning environments led them to construct their ideas about the nature of knowledge and knowing and choose strategies for learning. This highlights the importance of fostering students' perceptions of learning environment to develop the other desired outcomes for educational purposes.

According to Fraser (2007), the classroom learning environment research was originated from Walberg's and Moss' work during 1970s. In the theory of Moss (1979) about the classroom learning environment, the classroom learning environment consisted of the environmental and the personal systems that interaction between these systems influences each other. The environmental system includes physical setting, organizational factors, and humane aggregate and social climate (e.g. school location; Liu, 2010). The personal system includes sociodemographic variables, expectations, personality factors, and coping skills (e.g. students' gender; Liu, 2010). In the present study, we focus on two environmental system variables including class size and school location, in which may potentially affect students' perceptions of learning environment.

Class size

There is a huge discussion on whether class size should be small or large for economic and educational purposes (Harfitt, 2015; Graue, Hatch, Rao, & Oen, 2007). According to Fabunmi, Brai-Abu, and Adeniji (2007), class size was a crucial determinant on student's academic performance in Nigeria, and class congestion had negative impact on both teacher productivity and student learning input. However, Slavin (1990) reviewed research on the class size and argued that class size had positive effects on student outcomes but this effect on the achievement was extremely small. Addition to this, Glass and his colleagues (1982) published a meta-analysis combining the results of 77 empirical studies pertaining to the relationship between class size and achievement, and found that small classes were associated with higher achievement at all grade levels. It was found that the major benefits of reducing class size occurred where the number of students in the class was fewer than 20 (Glass et al., 1982; U. S. Department of Education, 1999).

In the literature few studies have focused on the influence of class size on students' perceptions of the classroom learning environment. A study by den Brok and his colleagues (2006) investigated the association between learning environment and the constructivist perceptions of a sample of 665 middle school students in California, and revealed that students in the larger class perceived constructivist environment as more positively than did in the smaller class although no significant difference was found between students in large and small classrooms. In another study, Levy, den Brok, Wubbels and Brekelmans (2003) examined the effects of school-, class- and teacher-level variables on the students' perceptions of the classroom learning environment. Levy et al. reported that class size was negatively associated with students' perceptions of the classroom learning environment. More specifically, the smaller the class size is, the more students perceived their teachers' behavior positively including satisfaction, friendly, and leadership. We have not located any study determining the influence of the class size on students' perceptions of the classroom learning environment amongst middle school students in Turkey. Furthermore, these two studies above demonstrate the direction (negative or positive) of the influence of class size on the classroom learning environment may vary one school from another. Thus, there is a need for further studies into the influence of class size on the classroom learning environment in Turkey.

School location

Differences between urban/rural area students' perceptions of the classroom learning environment were associated with broad variables by educational researchers. Research in urban/rural differences, in a broad sense, has focused on the differences in achievement, appropriateness of urban/rural achievement measures, and accessibility to resources (Young, 1998; Barton, 2007). However, according to Barton (2007), it is complex to compare student achievement relative to location as a careful consideration must be given to how individual factors interrelate with other factors, (e.g. classroom, school) to compound larger effect size (Norman, 2001; Barton, 2007). A study by Young (1998) revealed that the location of the school had a significant effect on student achievement, that students who attended in urban schools performed better than those in rural schools. Another study (Ballou & Podgursky, 1995) examining the difference between teachers' perception rural and urban schools reported that teachers in rural schools perceived the school environment were more positively than did in urban schools. In the literature, studies on students' constructivist perceptions in rural/urban locations have mostly focused only urban or rural school students. We have not found any comparison study dealing the constructivist classroom learning environment in urban and rural schools. Therefore, this study will address this gap and help future researchers have a closer look at the complexity mentioned by Norman et al. (2001) in the learning process and differences between rural/urban area's student perceptions.

The current study

Ministry of National Education of Turkey (MONE) introduced a new science education curriculum so as to improve science education from Grade 4 through Grade 8 in 2004 and implemented it in 2005 (MONE, 2005). With this reform movement, it was purposed to change science teaching from teacher-oriented to student-oriented. Several reasons can be account for this reform. One was to aim at catching the international level of constructivist oriented science teaching by giving students active roles in learning, rather than giving them passive roles in learning science, and meeting the requirement of European Union to enter in it (MONE, 2005). The other was that it was thought that this reform would be cure for unsatisfactory score in the international project and increase students' attitudes towards science. In the Third International Mathematics and Science Study (TIMSS) in 1999, for example, Turkey ranked 33rd out of 38 countries in Grade 8 level test showed that Turkish students' attitudes towards science were unsatisfactory (Den Brok et al., 2010). However, in TIMSS 2007 at Grade 8 level Turkey increased 21 points the average of students and ranked 31st out of 59 countries (Bayraktar, 2010).

Although it seems that reform movement gave positive results in students' achievement in international science tests, it is still unsatisfactory. One reason can be that the reform movement directly addressed the curriculum, rather than being purposed teachers' behavior and reflection on their teaching (Den Brok et al., 2010; Ozata-Yucel & Ozkan, 2014). Considering the requirement of the constructivist learning environment, teachers' reflecting on their teaching might be improved in the direction of less teacher-centered and more practice-oriented lessons that stimulate students' attitudes towards science (Den Brok et al., 2010; Yasar & Sozbilir, 2013). Another reason can be students' medium attitudes towards science. Cokadar and Kulce (2008), for instance, found a sample of 503 middle school students had medium attitudes towards science with 2.5% of the students showing (strongly) negative attitudes towards science. Therefore, there is still a need for deeper insight into the factors that might lead students to have negative attitudes towards science in Turkey.

Students' perceptions of the classroom learning environment are the strongest predictor of student attitudes toward to learning science (Cannon, 1997). A classroom learning environment should help teachers teach better, and consequently give students opportunities to learn better (Hassen & Childs, 1998; Liu, 2010). In the light of the literature, the purpose of this study is twofold: a) to determine differences between in students' perceptions of the classroom learning environment in large and small classrooms, and b) to examine any differences between students' perception of their classroom learning environment in rural and urban areas in terms of the constructivist paradigm. With this purpose, the following research questions were sought to address:

- Does school location (urban and rural) influence students' perceptions of the constructivist classroom learning environments?
- Does class size (small and large) influence students' perceptions of the constructivist classroom learning environments?

METHODS

A self-reported survey design was utilized to address the research questions. The Assessing of Constructivist Learning Environment (ACLE), as a self-report questionnaire, was used to collect data. Multivariate analysis of variance (MANOVA) was utilized to identify school location and class size differences in students' perceptions of the constructivist classroom learning environments.

a) Participants

The research sample consisted of 1882 Grade 6, Grade 7 and Grade 8 students from twenty middle schools in a northern city in Turkey. Table 1 represents the descriptive characteristic for the research sample. Glass and his colleagues (1982) in their meta-analysis study reported the ideal class size as 20 students. Therefore, in this study we identified a class as large if the number of students in that class was more than 20 students and as small if the number of students in that class was equal or less than 20 students and small. As for school location (urban or rural), we used the predetermined classification made by the Ministry of Turkish Interior, and randomly selected ten schools from each area.

Data were collected in May 2011. All instruments were administrated to the students in regular class hour under the supervision of their science teacher. Students were given 30 minutes to complete the instruments.

Table 1. *Distribution of participants in the study*

	School location		**Class size**		**Total**
Gender	Rural	Urban	Small (n<=20)	Large (20<n)	
Girls	266	649	255	660	915
Boys	279	688	272	695	967
Grade level					
Grade 6	173	474	185	462	647
Grade 7	178	443	157	464	621
Grade 8	194	420	185	429	614
Total	545	1337	527	1355	1882

n: the number of students in a classroom

b) Instrumentation

In this study the ACLE, developed by Arkun and Askar (2010), was used to examine students' perceptions of the constructivist classroom learning environment. Although in the classroom learning environment literature a various self-measurement instruments are available (e.g., Constructivist Learning Environment Survey (CLES) by Taylor and his colleagues, 1997), there are several reasons for selecting this particular instrument. First, as a self-report questionnaire, the ACLE was developed by native Turkish speaker researchers. This enabled the developers to consider the cultural dynamics of potential participants in process of developing items in the ACLE. Instruments developed and validated in other cultures, and then translated into Turkish may not be similar with Turkish cultural context (Hofer, 2008). Lastly, the ACLE nicely captures the aspects of constructivist classrooms including concurrent assessment in learning process highlighted by researchers (e.g., Bektas & Taber, 2009), and by the Ministry of National Education (MoNE, 2005).

The ACLE was based on the constructivist paradigm that supports recent research in science education. It includes relevant dimensions from past classroom learning environment questionnaires and combines these with dimensions that measure particular aspects of constructivism (Arkun & Askar, 2010). The ACLE is intended to map students' constructivist perceptions in six dimensions; *student-centered, thought provoking, collaborative, life relevant, concurrent learning and assessing,* and *different view-points*. Student-centered scale captures whether students play an active role in learning or not. Thought provoking scale measures to what degree learning environment prepossess learners. Collaborative scale captures to what degree learning environment allows for social interaction that is an important element of constructing knowledge. Life relevance scale is about knowledge is constructed by experience. Concurrent learning and assessment measures to what degree environment enable learners to monitor their learning. Bringing different viewpoints captures to what degree learning environment helps students develop their view points (Arkun and Askar, 2010).

The ACLE consists of a set of 28 items, which is on a 7-point Likert scale the degree to which they rate their constructivist perceptions (1 low to 7 high). Because a 7-point scale may be confusing for middle school aged students, we decided to convert the ACLE into a 5-point Likert (1= strongly disagree… 5= strongly agree) scale. To assess the ACLE's validity and dimensionality, Confirmatory Factor Analysis (CFA) was conducted with AMOS 18. Hu and Bentler (1999) recommended CFI>.95 or RMSEA<.06 for good fit and CFI>.90 and RMSEA<.08 for moderate fit. The initial CFA results were not in a satisfactory level (χ^2 (335, N=1882) = 1186.13, p<.001, SRMR =.062, RMSEA =.065, CFI =.89). It was suggested to use cut-off values of .30 for factor loading (Cabrera-Nguyen, 2010). Thus, Item 7 and Item 21 were removed because of low factor loading (.17 and .28, respectively). The CFA was re-run and those results indicated a good model fit (χ^2 (284, N = 1882) = 960.51, p < .001, SRMR =.03, RMSEA =.036, CFI =.95). Arkun and Askar (2010) reported ACLE's reliability with 247 college students as .76 for student-centered, .88 for thought provoking, .75 for collaborative, .89 for life relevance, .81 for concurrent learning and assessment, and .83 for bringing different viewpoints. In this study, we found ACLE's reliabilities as .72 for student-centered, .78 for thought provoking, .70 for collaborative, .69 for life relevance, .84 for concurrent learning and assessment, and .83 for bringing different viewpoints. ACLE's reliability values were in acceptable range, which were around .70 (George & Mallery, 2003). An example item from each scale in ACLE was presented in Table 2.

Table 2. *Typical item and reliability for each ACLE scale in the present study*

Scale	Typical item	Reliability	# of items
Student-centered	I have opportunity to decide about what subject I will work on	.72	4
Thought-Provoking	I am promoted to think in lesson	.78	7
Collaborative	I don't hesitate share my idea with others	.70	3
Life Relevance	I believe what I learn in lesson are relevant to daily life	.69	4
Concurrent Learning and Assessment	Assessments help me learn better	.84	3
Bringing Different Viewpoints	Class help me learn that everyone has different view points	.83	5

Correlations between the ACLE scales were computed as to see if they assessed distinctively different aspects of the learning environment. Table 3 represents the inter-correlation amongst the six dimensions in the ACLE.

Table 3. *Interscale correlation for ACLE*

Student-centered	1.00					
Thought-Provoking	.56	1.00				
Collaborative	.27	.31	1.00			
Life Relevance	.48	.65	.25	1.00		
Concurrent Learning and Assessment	.35	.45	.22	.47	1.00	.
Bringing Different Viewpoints	.60	.65	.26	.62	.44	1.00

Note: All correlations are statistically significant at 0.01 level

c) Data Analysis

In data analysis we followed several steps. First, we computed the average perception of the classroom learning environment scores ranged from 1 to 5 for each student for each scale. Then, to address the aforementioned research questions, we used MANOVAs to identify the influences of school location and class size differences in each classroom learning environment score. MANOVA is appropriate when the research wants to compare two or more independent variables in two or more groups (French, Poulsen, & Yu, 2006). All analyses were done with SPSS 21. Because the sample sizes in the groups (rural vs urban location, and small vs large groups) were unequal, the homogeneity of variance was analyzed through Box's M test in SPSS (Tabachnick & Fidell, 2013). The tests of homogeneity of variance were not significant for school location (F (21, 2588288) = 1.23, p= .21) and for class size (F (21, 2890773) = 1.35, p= .13).

FINDINGS

The mean and standard deviation value for each variable within groups were presented in Table 4. These descriptive statistics (mean scores and standard deviations) may give an idea about the students' perceptions on the constructivist classroom learning environment. The students' perceptions on the constructivist learning environment were between moderate and high with some variance; the means were close to but above the mid-point. The life relevance dimension had the highest mean value (M = 3.89), whereas the collaboration dimension had the lowest mean value (M = 3.31).

Table 4. *Means and standard deviations for variables in the study by location and class size*

	Location Mean (SD)		**Class size Mean (SD)**		**All (N=1882) Mean (SD)**
ACLE	Rural	Urban	Small (n<=20)	Large (20<n)	
SC	3,72(0.77)	3,68(0.73)	3,69(0,77)	3,69(0,73)	3,69(0.74)
TP	3.84(0.65)	3,71(0.68)	3,80(0,66)	3,72(0,66)	3,74(0.67)
CO	3,38(0.60)	3,28(0.62)	3,38(0,58)	3,28(0,61)	3,31(0.60)
LR	4.04(0.77)	3.83(0.81)	4,00(0,77)	3,85(0,80)	3,89(0.80)
CLA	3,61(0.60)	3,49(0.62)	3,58(0,61)	3,50(0,62)	3,52(0.61)
BDV	3,91(0.70)	3.80(0.70)	3,90(0,71)	3,81(0,70)	3,83(0.70)

Note: SC: Student-centered, TP: Thought-Provoking, CO: Collaborative, LR: Life Relevance, CLA: Concurrent Learning and Assessment, BDV: Bringing Different Viewpoints.

a) Differences between students' perceptions of constructivist environment in rural/urban areas

MANOVA with SPSS 21 were used to address the first research question. MANOVA results revealed a statistically significant difference in students' perceptions of the constructivist classroom learning environment based on school location, F (6, 1875) = 6.26, *p* < .001; Wilk's Λ = 0.98. Addition to this, the post ANOVA test results revealed that there were statistical differences on dimensions of thought provoking (F (1, 1881) = 13.55, p<.001), collaborative (F (1, 1881) = 9.73, p=.002), life relevance (F (1, 1881) = 27.50, p<.001), concurrent learning and assessment (F (1, 1881) = 13.95, p<.001), and bringing different viewpoint (F (1, 1881) = 8.82, p=.003). Yet, there was no statistically significant difference on the dimension of student centered based on school location (F (1, 1881) = 1.32, p=.25).

Considering mean scores on Table 4, these results point out that the rural school students perceived their classroom learning environment more constructivist than did the urban school students. More specifically, the students in rural schools more positively reported their constructivist environment in terms of life relevance (M= 4.04 vs M= 3.83). Additionally, the students on rural location reported perceiving more positive classroom learning environment on thought provoking collaborative (M= 3.38 vs M= 3.28), concurrent learning and assessment (M= 3.61 vs M=3.49), and bringing different viewpoints (M= 3.91 vs M= 3.80) than did those in urban location. Addition to these results, the students in rural schools reported the highest mean score on life relevance, whereas they did the lowest on the collaboration. Similarly, the students in urban school reported highest mean score on life relevance, whereas the lowest mean score was on the collaboration.

b) Differences between students' perceptions of constructivist learning environment in large/small classroom

To address the second research question, again we used MANOVA with SPSS 21. MANOVA results yielded a statistically significant difference on students' perceptions of the constructivist classroom learning environment across small versus large classes (F (6, 1875) = 3.83, p =.001; Wilk's Λ = 0.98). Addition to this, the post ANOVA test results revealed that there were statistical differences on dimensions of thought provoking (F (1, 1881) = 4.23, p<.04), collaborative (F (1, 1881) = 8.19, p=.004), life relevance (F (1, 1881) = 13.23, p<.001), concurrent learning and assessment (F (1, 1881) = 5.20, p=.023), and bringing different viewpoint (F (1, 1881) = 4.93, p=.026). The post ANOVA revealed no statistically significant difference on the dimension of student centered based on class size (F (1, 1881) = 0.50, p=.82).

Considering mean scores on Table 4, these results point out that the students on small classes perceived their constructivist learning environment more constructivists-based than did those in large classes. More specifically, the students in small classes reported their classroom learning environment more life relevance (M= 4.00 vs M= 3.85), thought provoking (M= 3.80 vs. M= 3.72), collaborative (M= 3.38 vs M= 3.28), concurrent learning and assessment (M= 3.58 vs M=3.50), and bringing different viewpoints (M= 3.90 vs M= 3.81) than did those in large classes. Addition to these results, the students in rural schools reported the highest mean score on life relevance, whereas they did the lowest on the collaboration. Again, students in both groups reported highest mean score on life relevance, whereas the lowest mean score was on the collaboration.

DISCUSSION and CONCLUSION

The main purpose of this study was to investigate the middle school students' perception of their classroom learning environment by using the ACLE questionnaire and to see if it differed in terms of class size and school location. With respect to the first research question, a statistically significant difference between students' perceptions of the classroom learning environment in small and large classes was found. Students who were in small classes rated their learning environment more constructivist based than those who were in large classes. Students in the sampled small class rated their classroom learning environment the highest on life relevance dimension. They also rated the collaboration dimension as the lowest feature of their constructivist classroom learning environment. These findings supported the previous study have reported that class size is an important factor that effects student' perceptions. Compared to the previous studies conducted in other countries, although Den Brok et al. (2006) found students in large class perceived their constructivist environment higher than those who were in small classes, consistent with Levy et al. (2003), it was found that students in small class was perceived their constructivist learning environment more positively than those who in large class. This may be because of the cultural difference or other factors dynamic such as age, gender, and teachers and the like, that effect students' perception. Overall, small class enables students to be paid more individualized attentions by their teacher. It may increase student achievement to reduce class size below 20. The issue of class size is essential to increasing our understanding of students learning needs.

As for the second research question, significant difference was found between students' constructivist perception in rural and urban areas. An interesting finding of the study was that students schooling in rural areas perceived their learning environment more positively than those in urban area. Similar to finding in the class size, students in rural and urban area rated their classroom the most constructivist-oriented in life relevance scale and the least in collaboration. Compared to previous studies conducted in other countries, although Young (1998) reported that students in urban areas performed better than those in rural areas, in this study the findings showed that students who were in rural areas rated higher their constructivist environment than those who were in urban areas.

The findings of this study can have practical implication for science teachers. One important finding of this study is that students in large/small classes and urban/rural schools in the sample perceived their constructivist environment less collaborative. Collaboration is an important tool in the knowledge construction and socialization (Arkun & Askar, 2010). Classroom should be the place where students reflect, share and discuss their ideas with each other. Therefore, teachers should pay more attention on how students can collaborate with each other and arrange their classroom practices. Moreover, students should be encouraged to work together by their teachers rather than studying individual. Teachers may design their classroom in a way that students may easily collaborate with each other such as the laboratory design in squared tables, rather than a conference design in their classrooms. Such a learning environment may increase learner interaction, and so provide rich experiences and better learning (Pratt, 2003).

Limitation of study

This study has certain limitations. First, during the validation of the instrument, two items were removed from the analysis. Therefore, further research is needed to validate the questionnaire and duplicate the present study. Second, because we conducted this investigation in only 20 schools in Trabzon, located in Black Sea region in Turkey, future researchers should approach with this caution on generalization of these findings. Third, this study took into consideration two factors, class size and school location, which may affect students' perception. Therefore, the effects of the other factors that literature suggests should be considered.

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