DEVELOPMENT OF INQUIRY-BASED LEARNING ENVIRONMENT SCALE: A VALIDITY AND RELIABILITY STUDY

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ABSTRACT

Researchers have studied the effects of using inquiry-based teaching in science lessons on students' learning for many years. Based on this, the purpose of this study is to develop an inquiry-based learning environment scale for middle school science classes and to conduct validity and reliability analyses. The Inquiry-Based Learning Environment Scale (IBLES) was first created with 63 items based on literature review. The scale, which was finalized after taking expert opinions, includes 37 items in total. The scale was applied to 765 students, including 364 female and 401 male students, studying at a middle school. First, Kaiser-Meyer-Olkin and Bartlett Sphericity tests were conducted for the suitability of the data for factor analysis. The results obtained showed that the data were suitable for factor analysis. Then, exploratory factor analysis was carried out. As a result of the factor analysis, six items were removed from the scale, the remaining 31 items were gathered under seven factors, and the items under these factors were established. Confirmatory factor analysis of the scale was carried out with the LISREL program, and it was found that the model's compliance level with the data was good. Cronbach's alpha reliability coefficient of the whole scale was calculated to be .815 in the reliability analysis of the IBLES. The internal consistency coefficients of the items in each factor and the relationship between the factors were calculated using the Pearson Correlation coefficient. As a result, it was found that this scale has a sufficient level of validity and reliability that it can also be used in other studies to evaluate the learning environment of middle school students.

Keywords: *Inquiry, Scale Development, Middle School Students, Student Perceptions*

INTRODUCTION

The learning process should be examined in order to observe, improve, or renew teaching and learning techniques in parallel with the developments of the world (Algozzine, Morsink & Algozzine, 1988). New studies on how students can actively participate in the learning process are still being carried out, and in addition, research and inquiry in fields such as Science and Mathematics make students more active in their own learning processes. (Lazonder & Harmsen, 2016). Inquiry is an essential approach for students to understand and use scientific concepts (Bevins & Price, 2016). Inquiry is an inseparable part of learning processes of students. Science educators generally agree that the inquiry-based learning approach is suitable for science (Cairns, 2019). In this process, students question what is happening in their environment, thus learning takes place. Inquiry-based learning is a practical method for making connections between existing knowledge and the new material being learned. (Eltanahy & Forawi, 2019). It is a more student-centered teaching-learning approach in which students learn scientific inquiry methods and learn how to question. In such an environment, teachers facilitate the learning process (Maaß & Artigue, 2013). In inquiry-based learning, teachers help students to learn. They execute the inquiry process through small group discussions and reciprocal teaching (Saunders-Stewart, Gyles, Shore & Bracewell, 2015). When enriched with different techniques and strategies, inquiry-based learning encourages students to study, to understand the subject, and to become academically successful (Chang & Mao, 1999). Inquiry-based learning enables students to learn about a topic through individual research. (Lazonder & Harmsen, 2016). It aims to encourage the students to explore. Exploration is a complex scientific process, and students carry out inquiry in multiple stages, breaking down a scientific thought into parts that focus on the critical points (Pedaste et al., 2015). Moreover inquiry-based learning develops critical thinking skills in general (Duran & Dökme, 2016), encouraging students to explore what is happening around them. Thus, students can look at their learning processes with a critical eye and contribute to their own improvement by identifying their shortcomings.

In an inquiry-based classroom environment, teachers should provide education in a suitable and fully equipped environment that prepares students for the future, instead of lecturing them using a fixed source (Abdi, 2014). Supportive environments requiring high-level teacher-student interaction and constructive feedback are vital elements in inquiry-based learning (Kang, 2020). The process of training students to become science-literate individuals through necessary skills can be realized by providing an appropriate learning environment that has certain elements depending on factors such as their knowledge level, interests, age, and development level. We must focus on the quality of the learning environment to educate students like scientists, respond to their needs and curiosities, and ensure that they benefit from education at the highest level. The classroom learning environment, sometimes referred to as the educational environment or classroom atmosphere, is the social atmosphere where learning takes place (Johnson & McClure, 2004). The learning environment can be defined as a set of general characteristics for the classroom atmosphere, in which the interaction among the students, between the students and the teacher, between the students and the course material, and between the teacher and the course material. (Agbaria & Atamna, 2014).

The concepts of teaching and learning are also social processes. (Dawes, 2004). Learning environments that focus on directly conveying to students the information cannot encourage students to question (NRC, 2001). Studies show that students' learning approach partly depends on how students perceive the learning environment (Diseth, 2007). At the same time, it has been argued that learning environments are the most powerful factor in determining and predicting student attitudes towards science (Johnson & McClure, 2004). In creating such environments, students should be provided with all kinds of opportunities to use information. In addition, teachers also have a great responsibility. During the inquiry process, teachers are expected to give students a chance to work independently, allow them to do their own research, and make their own decisions (Bardone, Burget, Saage & Taaler, 2017). In studies on learning environments, it is argued that the classroom learning environment is the strongest predictor of attitude towards science in each classroom (Johnson & McClure, 2004). It is known that many factors shape learning environments. A positive classroom environment undoubtedly contributes to developing students' personalities, the school environment, and the surrounding community (Agbaria & Atamna, 2014). While the classroom's learning environment can be changed to increase student outcomes, researchers must have a tool to measure the learning environment before making any changes to increase its effectiveness (Walker, 2004). While observations, investigations, and interviews can provide information about the teacher, they do not provide enough information about the learning environment (Johnson & McClure, 2004). For this reason, using a learning environment scale is a less subjective, more qualitative and economical way of evaluating the learning environment (Walker, 2004). This research method is based on validated, significant, and wide-ranging scales to determine student and teacher perceptions of the learning environment in the research environment (Fraser, 1998). Learning environment scales effectively guide researchers, helping students and teachers think about their ideas, and reshaping teaching practices (Taylor & Fraser, 1991). There are many views on learning environments, each of which contributes to our understanding of learning. Learning environment studies are based on scales to determine student and teacher experiences and preferences (Tobin, 1997). Many learning environment scales have been developed and used around the world. Tools with proven validity, reliability, and usefulness have been identified through literature review, and various learning environment scales have been developed. The most frequently used of these scales is the Constructivist Learning Environment Scale (CLES). CLES enables researchers and teachers to follow constructivist teaching approaches and to address situations related to the development of classroom environments (Taylor & Fraser, 1991). The CLES scale has been widely used to identify student perceptions of classroom environments dominated by constructivism. The goal of the Classroom Environment Scale (CES), Individualized Classroom Environment Questionnaire (ICEQ), and Science Laboratory Environmental Inventory (SLEI), which are other scales that measure learning environment, is to identify the student perceptions of learning environments (Skordi & Fraser, 2019). Information about the scale developed in this study and the reasons for its development are given below.

Research Problem

It has become a necessity to develop science lesson curricula updated in recent years according to the changing and developing needs of learning environments. The science curricula in many countries emphasize the need to organize lessons according to the inquiry-based learning approach (MoNE, 2018; NCCBE, 2004; NGSS, 2013; NRC, 2001). It is also important to identify student perceptions of existing learning environments, where inquiry-based teaching is essential. Learning environments offer students opportunities to discuss what to learn and how best to learn (Ovbiagbonhia, Kollöfel & den Brok, 2019). Student perceptions of learning environments affect their learning process. Rather than the learning environment itself, student perceptions of a learning environment indicate how much students will learn and to what extend a learning environment will be effective (Könings, Brand-Gruwel & Van Merriënboer, 2005).

For this reason, it is crucial to use scales to identify student perceptions of the learning environment. Despite the frequent use of an inquiry-based learning approach in science classes, no scale that aims to identify student perceptions of inquiry-based learning environments has been found. The goal of this study is to develop an inquiry-based learning environment scale for science classes. Based on this, this study seeks to answer the question, "Is the Inquiry-Based Learning Environment Scale (IBLES) a valid and reliable measurement tool?"

METHODOLOGY

This study is a scale development study aimed at identifying middle school student perceptions of learning environments regarding the inquiry-based classroom environment.

Sample

The research was conducted in 11 state schools in five large cities in Turkey with 765 students in fifth, sixth, seventh, and eighth grades. Convenience sampling method, one of the non-random sampling methods, has been used for sampling. Table 1 below contains data regarding the demographic characteristics of the students in the sample.

Table 1
The Demographic Characteristics of the Students in the Sample

Variables		N	%
Grade	5th Grade	17	2.2
	6th Grade	82	10.7
	7th Grade	419	54.8
	8th Grade	247	32.3
Gender	Female	385	50.3
	Male	380	49.7

Most of the students in the sample were selected from seventh and eighth-grade levels because they have a higher awareness of their learning environment and can better evaluate their environment. In addition, it was considered that they would be more sufficient in identifying their perceptions about inquiry-based learning environments since they have been receiving inquiry-based education for a longer time.

Scale Development Process

The items in the IBLES were created by a field education specialist who has a PhD degree in science education. While creating the items, the literature was reviewed regarding inquiry-based learning and learning environments. The expressions that were considered necessary in an inquiry-based classroom environment were included in the scale, and as a result, 63 items were created. The scale was then presented to two science educators who are experts in the field of scale development. After expert opinions were received, a structure was created by correcting or removing the scale items. The final scale consists of 37 items in total. There are 25 positive and 12 negative statements in the pilot implementation of the IBLES. The IBLES was developed as a five-point Likert-type scale with options of "Strongly Agree," "Agree," "Undecided," "Disagree," and "Strongly Disagree."

Data Analysis

First, the data obtained was entered into the SPSS 22 package program. The "Strongly agree" option was given 5 points; "Agree," 4 points; "Undecided," 3 points; "Disagree," 2 points; "Strongly disagree," 1 point. The scoring was reversed for the negative statements. The suitability of the data for factor analysis was checked with Kaiser-Meyer-Olkin (KMO) and Bartlett Sphericity tests. KMO and Bartlett Sphericity test results effectively identify sampling suitability (Firend & Abadi, 2014). The analysis results of KMO and Bartlett Sphericity revealed that the data are suitable for exploratory factor analysis (EFA). In the exploratory factor analysis, the factor load values of the scale items were calculated with the varimax method. In the varimax method, rotation is used to maximize factor variances with fewer variables (Abdi, 2003). Thus, items with low factor load values were identified and removed from the scale.

Confirmatory factor analysis (CFA) of the scale was carried out with the LISREL 8.80 statistical program. The approximate square root of errors, fit index, corrected fit index, comparative fit index, normed fit index, and root mean square error were calculated with CFA. For reliability, the Cronbach alpha reliability coefficients of the whole scale, for each factor, and for each item were calculated. To determine the discriminatory power of the items in the scale, the differences between the factor average scores in the lower 27% and upper 27% groups were calculated with the unrelated t-test. From the results obtained, it can be determined to what extent the items in the scale differentiate individuals in terms of the desired behavior (Büyüköztürk, 2018). Relationships between factors were identified with the Pearson Correlation coefficient, and the relationships between the factors were identified.

FINDINGS

In this part of the study, the findings obtained from the validity and reliability analyses of the IBLES are presented.

Findings Regarding the Validity of IBLES

The findings obtained from the Kaiser-Meyer-Olkin (KMO) and Bartlett Sphericity tests carried out for the validity analysis of the IBLES are given in Table 2 below.

Table 2
Kaiser-Meyer-Olkin (KMO) and Bartlett Sphericity Test Values

Tests		Value
Kaiser-Meyer-Olkin (KMO) sampling adequacy		.93
Bartlett Sphericity test results	Chi-square Value	6861.1
	sd	465
	p	.0001

As can be seen in Table 2, the KMO value of the IBLES was calculated to be .93. When we look at Bartlett Sphericity results, the Chi-square (x^2 $_{(465)}$ = 6861.1, p <.05) values are significant. As a result of KMO value being higher than .60 and Barlett Sphericity test result giving significant results, it was determined that the data obtained from the scale are suitable for exploratory factor analysis (EFA) (Büyüköztürk, 2018; Tabachnick & Fidell, 2001). Then, the number of factors in the scale and the items included in the factors were determined. For this purpose, the varimax rotation method has been used. Table 3 below shows the factor load values of the scale.

Table 3
Factor Loads of Items in Rotated Principal Component Analysis Method

Items	Factor Loads						
	F_1	F_2	F_3	F_4	F_5	F_6	F_7
Factor 1: Student participation							
I7	.738						
I8	.688						
I6	.668						
I10	.625						
I12	.600						
I9	.550						
I11	.505						
Factor 2: Paying attention to ideas							
I34		.746					
I36		.742					
I35		.656					
I31		.651					
I32		.634					
I33		.595					
Factor 3: Collaboration							
I4			.625				
I13			.612				
I23			.610				
I26			.589				
I2			.564				
I5			.559				
I15			.519				
Factor 4: Learning							
I22				.685			
I21				.604			
I24				.551			
I17				.541			
I25				.527			
Factor 5: Asking questions							
I1					.790		
I3					.762		

Factor 6: Observation		
I18	.749	
I19	.702	
Factor 7: Focusing on problems		
I29		.633
I20		.592
Explained Variance Factor 1		11.156%
Factor 2		21.712%
Factor 3		30.950%
Factor 4		38.234%
Factor 5		43.536%
Factor 6		48.564%
Factor 7		53.451%

EFA results and explained variance rates of IBLES are given in Table 3. As a result of EFA, it was found that 31 scale items with an exploratory nature were gathered under seven factors. It is seen that the total variance of 31 items gathered under 7 factors in IBLES explains 53.451% of the statements of student perceptions of an inquiry-based learning environment. It is considered sufficient that the explained variance is between 40% and 60% (Çokluk, Şekercioğlu & Büyüköztürk, 2014; Tabachnink & Fidell, 2001). According to EFA varimax rotation results, the six items numbered I14, I16, I27, I28, I30, I37 were excluded from the analysis because they overlapped, and their factor loads were found to be lower than .50. Factor loads of the other 31 items in the scale range between .790 and .505. The fact that the factor loads of the remaining factors are higher than .50 indicates that they measure the structure at a high degree (Kline, 1994).
The obtained number of items in the factors and the item numbers are listed below in Table 4.

Table 4
Sub-dimensions and the Items in Dimensions Obtained as a Result of EFA

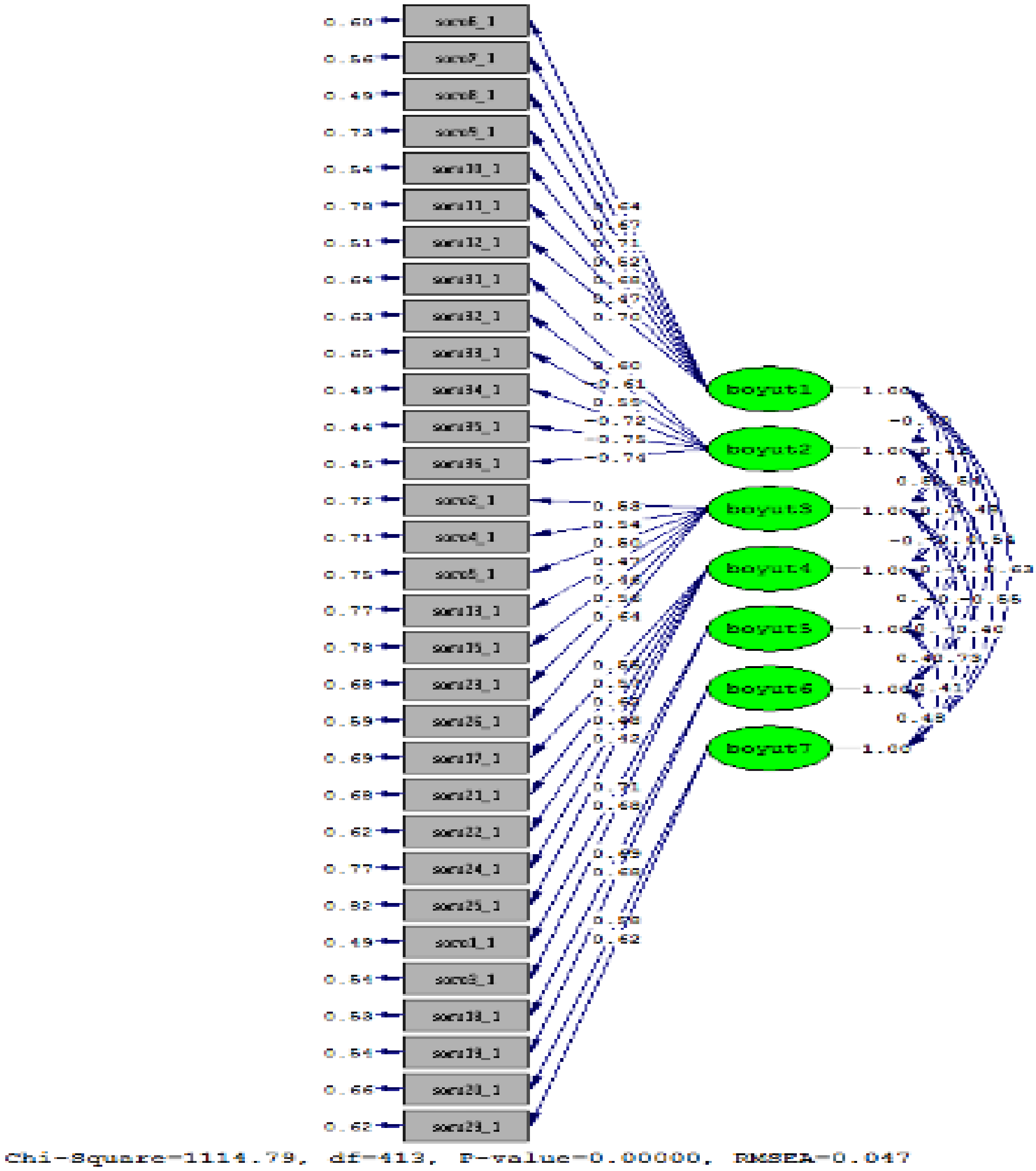
Factor Number	Determined Factors	Number of Items	Item Number
Factor 1	Student participation	7	I6-7-8-9-10-11-12
Factor 2	Paying attention to ideas	6	I31-32-33-34-35-36
Factor 3	Collaboration	7	I2-4-5-13-15-23-26
Factor 4	Learning	5	I17-21-22-24-25
Factor 5	Asking questions	2	I1-3
Factor 6	Observation	2	I18-19
Factor 7	Focusing on problems	2	I20-29

As indicated in Table 4, there are a total of 31 items in IBLES under seven factors. There are seven items under the first factor, student participation (I6, I7, I8, I9, I10, I11, I12), six items under the second factor, paying attention to ideas (I31, I32, I33, I34, I35, I36), seven items under the third factor, collaboration (I2, I4, I5, I13, I15, I23, I26), five items under the fourth factor, learning (I17, I21, I22, I24, I25), two items each under the fifth factor, asking questions (I1, I3), the sixth factor, observation (I18, I19), and the seventh factor, focusing on problems (I20, I29).

Confirmatory factor analysis (CFA) was carried out to define multivariate statistical analyses involving structures represented by multiple measured variables (Harrington, 2009). To verify the structure obtained from EFA, the LISREL program was used for DFA, and the compatibility of the structure was checked according to the fit statistics. The findings obtained as a result of the CFA of the IBLES are listed below.

According to the CFA results, χ2 = 1114.79 (sd=413, p= .00), χ2 / df = 2.69, RMSEA (root mean square error of approximation) = .047, GFI (fit index) = .91, AGFI (adjusted goodness of fit index) = .90, CFI (comparative fit index) = .96 and NFI (normed fit index) = .94, RMR (root mean square residual) = .053. According to the results obtained from CFA, the values obtained from the structure are compatible. The fact that the GFI, AGFI, CFI, NFI values are above .90 indicates that the model has a good degree of compatibility with the data (Byrne, 2010; Schermelleh-Engel, Moosbrugger & Müller, 2003; Raykov & Marcoulides, 2006). Similarly, a RMSEA value below .05 indicates perfect fit (Hu & Bentler, 1999; Vieira, 2011).

Figure 1 shows the path diagram and the standardized values of the model below.



Findings Regarding the Reliability of IBLES

Cronbach alpha reliability coefficient of all items and each factor in the scale, item internal consistency coefficients, item discrimination power, and the relationship between the factors were calculated for the reliability analysis of the IBLES. Table 5 below shows the findings obtained as a result of the analysis.

Table 5

Internal Consistency Coefficients as a Result of the Reliability Analysis of the IBLES

Factor Number	Factor Names	Cronbach Alpha Value	Number of Items
F1	Student participation	.817	7
F2	Paying attention to ideas	.803	6
F3	Collaboration	.735	7
F4	Learning	.657	5
F5	Asking questions	.651	2
F6	Observation	.634	2
F7	Focusing on problems	.532	2
	Total	.815	31

p<.001

Cronbach alpha reliability coefficient of 31 items remaining after eliminating six items was found to be .815. A reliability coefficient higher than .80 indicates that the whole scale is reliable (Murphy & Davidshoper, 1988). Since the scale's reliability coefficient is high, it was decided not to eliminate any other items from the scale. The internal consistency coefficients of sub-dimensions are .817 for factor 1, .803 for factor 2, .735 for factor 3, .657 for factor 4, .651 for factor 5, .634 for factor 6, and .532 for factor 7.

Item analysis was applied to find the discriminatory power of 31 items in the IBLES, and the differences between the factor average scores of the lower 27% and upper 27% groups according to the total scores of the scale were found using the unrelated t-test. As a result of the analysis, according to the t-test results between the lower 27% and the upper 27% groups, a significant difference at the level of .05 was found among all factors. The significant difference between the lower and upper groups is an indicator of the test's internal consistency. Besides, it was aimed to find the relationship between the factors with the Pearson Correlation coefficient values. Table 6 below shows the relationship between the factors.

Table 6

Pearson Correlation Analysis Results Regarding the Relationship between Factors

	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
Factor 1	.399**	-.316**	.417**	.363**	.396**	.424**
Factor 2		-.039	.208**	.185**	.193**	.256**
Factor 3			-.355**	-.275**	-.301**	-.251**
Factor 4				.300**	.383**	.438**
Factor 5					.298**	.244**
Factor 6						.277**

p** <.001

In the item total correlation analysis, the statements in the factors were collected, divided by the number of statements, and converted into a single item, and the Pearson Correlation coefficient was calculated. It was concluded that the Pearson correlation coefficients obtained for each factor, except for paying attention to ideas (F2) and collaboration (F3) factors, have a bilateral relationship. When the other factors are examined, relationship was found between student participation (F1) and paying attention to ideas (F2) (r = .399; p <.001), learning (F4) (r = .417; p <.001), asking questions (F5) (r = .363; p <.001), observation (F6) (r = .396; p <.001), and focusing on problems (F7) (r = .424 p <.001). Relationship was found between paying attention to ideas (F2) and learning (F4) (r = .417; p <.001), asking questions (F5) (r = .185; p <.001), observation (F6) (r = .193; p <.001), and focusing on problems (F7) (r = .256; p <.001). A negative relationship was found between collaboration (F3) and student participation (F1) (r = -.316; p <.001), learning (F4) (r = -.355; p <.001), asking questions (F5) (r = -.275; p <.001), observation (F6) (r = -.301; p <.001), and focusing on problems (F7) (r = -.251; p <.001). Relationship was found between learning (F4) and asking questions (F5) (r = .300; p

<.001), observation (F6) (r = .383; p <.001), and focusing on problems (F7) (r = .438; p <.001). Relationship was found between asking questions (F5) and observation (F6) (r = .298; p <.001), and focusing on problems (F7) (r = .244; p <.001). Relationships were found between observation (F6) and focusing on problems (F7) (r = .277; p <.001). As a result of the analysis, it was seen that the discrimination level of the factors is sufficient.

DISCUSSION

The goal of this study was to develop a scale for identifying middle school student perceptions of inquiry-based learning environments in science lessons. As a result of the literature review, a 5-point Likert-type scale with 63 items was created and presented to expert opinion. After taking expert opinions, the scale was reduced to 37 items. The scale obtained from the validity and reliability analyses of the IBLES consists of 31 items and seven factors.

IBLES was first used with 765 middle school students. The data obtained from this application of the scale to middle school students were analyzed using SPSS and LISREL statistics programs. The suitability of the data for factor analysis was identified using Kaiser-Meyer-Olkin (KMO) and Bartlett Sphericity tests. In the obtained data, the KMO value was found to be .93. A KMO value greater than .90 is considered an outstanding value (Field, 2005), while it shows that the KMO value in this study is suitable for factor analysis. The significance value (p = .000 <.05) was obtained in the Bartlett Sphericity test, which reveals that the variables are positively correlated to provide a suitable basis for factor analysis (Barrett & Morgan, 2005).

Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were carried out to test the validity of IBLES. As a result of varimax rotation, the scale, which initially consisted of 37 items, was finalized to have 31 scale items and seven factors. Six items in the scale were excluded from the scale due to overlapping and having factor loads lower than .50. The factor loads of the items remaining in the scale vary between .790 and .505. The factor loads of the remaining items show that they measure the structure at a high degree. The remaining 31 items in the scale explain 53.451% of the total variance of 7 factors of middle school student perceptions of inquiry-based learning environments. The fact that the total variance is over 50% indicates that this scale is sufficient in explaining the statements it should explain.

As a result, 31 items in IBLES were gathered under seven factors in total. There are seven items under the first factor, and this factor is called student participation. Inquiry-based learning refers to the students' need to participate in the learning process and manage their own learning process (Kang & Keinonen, 2018; van Uum, Verhoeff & Peeters, 2017). With the first factor, the structure related to student participation in inquiry-based lessons was measured. Six items were included under the second factor, the factor of paying attention to ideas. In an inquiry-based learning environment, teachers play a role in creating situations that enable students to express their thoughts (Tang, 2016). Students who value their ideas are comfortable with expressing their ideas. The second factor determines perceptions about the importance given to the ideas explained in the classroom environment. The third factor is collaboration and there are six items under this factor. In inquiry-based classrooms, students participate in the learning process and share and discuss ideas (Chan & Pow, 2020; Smith, 2000). When teachers create opportunities for students to participate in collaborative activities and reflect on their experiences, students will work together to develop their ideas (Gillies & Baffour, 2017). There are five items in the fourth factor, which is learning. Under the learning factor, it was aimed to identify student perceptions about the learning process. There are two items in the fifth factor, asking questions. The inquiry is a question-based learning process that allows students to formulate searchable questions, design informative research, collect and prioritize evidence, and come up with persuasive explanations (Krajcik et al., 1998). In inquiry-based learning environments, teachers ask students questions to facilitate learning, and they aim to support learning by asking them to form probable answers to these questions (Dunkhase, 2003). With the fifth factor, it was aimed to identify student perceptions about asking questions. There are two items in the observation factor, which is the sixth factor of the scale. The seventh factor, focusing on problems, includes two items as well. Inquiry-based learning refers to the students' need to seek solutions by identifying problems determined by their teachers or themselves (Sadeh & Zion, 2009). Seven factors and 31 items obtained and named from the scale resulting from EFA contain statements that should be found in an inquiry-based classroom environment. The obtained factors coincide with inquiry-based learning requirements in the studies in the literature, as mentioned above.

In the next step of the factor analysis, CFA was carried out using the LISREL program. In the CFA results, GFI, AGFI, CFI, and NFI values of above .90 indicate that the model's suitability with the data is good, while a RMSEA value of .047, which is below .05, indicates that the fit is right.

After the validity analyses of the IBLES, further analyses were carried out for reliability. In the reliability analysis, the Cronbach alpha coefficient of the whole scale and the factors were calculated. The Cronbach alpha reliability coefficient value of the whole scale was calculated to be .815, and the fact that this value is higher than .80 indicates that the developed scale is reliable. This value shows that the reliability of the whole scale is high. As a result of the unrelated t-test performed to determine the discriminatory power of 31 items in the scale, a significant difference was found between all factors. In item-total correlation analysis, Pearson correlation coefficient was calculated, and relationships between factors were identified. According to the results obtained, it was found that there is a bilateral relationship between all factors except the factors of paying attention to ideas and collaboration. In other words, student participation, learning, asking questions, observation, and focusing on problems are related to all the other six factors.

CONCLUSION

In conclusion, based on above discussions, it was found that the validity and reliability of IBLES that has been developed to evaluate inquiry-based learning environments of middle school students, are at a high level as the results of the analyses revealed. The scale can be used to identify student perceptions of inquiry-based learning environments in science classes.

The following recommendations are made in the light of these results. IBLES can be improved to examine the effectiveness of initiatives in education, evaluate teaching/learning styles, transform them into different approaches, and examine the effects of the student approaches. In addition, contributions can be made in this direction by helping teachers gain perspective and think about inquiry-based classroom environments and develop them. The questionnaire developed will help us understand the inquiry-based teaching process in the learning environment and help us meet student expectations regarding the teaching process in line with the information we have acquired about the classroom.

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Appendix: Inquiry-Based Learning Environment Scale (IBLES) Items

	I STRONGLY AGREE	I AGREE	I AM UNDECIDED	I DISAGREE	I STRONGLY DISAGREE
In our Science Class					
1. I can easily ask questions to my classmates.					
2. I do not work collaboratively with the other students in the class.					
3. My classmates in the class quickly ask me questions.					
4. I do not help my classmates in the class.					
Our Science teacher					
5. Does not encourage us to express our ideas.					
6. Values the answers we give in response to the questions.					
7. Guides us when we are stuck.					
8. Values our feelings and thoughts.					
9. Encourages us to ask questions about the situations we encounter.					
In our Science Class					
10. We can explain our ideas easily.					
11. We defend our ideas.					
12. We can easily explain our ideas about the problems related to the subject.					
13. We do not exchange ideas with our classmates about how to solve problems.					
14. We explain our opinions on the subject with reasons.					
15. I do not research to defend my opinions on the subject.					
16. I do not research to defend the ideas I have presented to solve the subject's problems.					

17. I can find answers to some problems by using the information I have gathered from research.					
18. We make observations with my classmates to solve problems.					
19. We discuss the data obtained from the observations with our classmates.					
20. I am interested in problems related to the subject.					
21. I compare the information we obtain with the knowledge I already have.					
22. I use the information we gather to solve new problems.					
23. I do not share resources with my classmates whom I collaborate with.					
24. I question what I learned and how I learned it.					
25. I am aware that I am responsible for my learning.					
26. I do not learn new information from my classmates in the class.					
27. I ask my classmates questions about their learning.					
28. I am eager to learn science.					
29. I concentrate fully on the science class.					
30. I do not know the importance of the science course.					
Our Science Teacher					
31. Does not give me a hearing in class discussions as much as other students.					
32. Cares about my questions as much as the questions of other students.					
33. Does not care about my opinions as much as the opinions of other students.					
34. Allows me to contribute to the work done in class as much as the other students.					
35. Encourages me as much as my classmates about the ideas I offer to problems.					
36. Allows me to participate in activities in the classroom as well as other students.					
37. Does not consider my suggestions as much as the suggestions of other students.					