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The Effectiveness of the Jigsaw Instruction Method for Teaching Quadrilaterals in Middle School

Akan Volkan Çalık, Ahmet Kaçar

Abstract. In the study presented in this paper, we compared academic success outcomes in a 7th grade mathematics class for students learning the concept of quadrilaterals by traditional methods and the Jigsaw technique of cooperative learning. A secondary goal of the research was to assess the students' opinions about their experiences learning with the Jigsaw technique. This study was conducted over a seven-week period in a middle school, using both qualitative and quantitative methods. The quantitative part is conducted by a post-test control group random experimental method. In the qualitative part, we completed a content analysis. The sample of the study includes 50 students; 25 in the control group and 25 in the experimental group. Jigsaw method was used for the experimental group and traditional teaching methods were used for the control group to teach quadrilaterals. The results show that the difference between the success of the experimental and control group in the mathematics achievement tests is significantly in favour of the experimental group. Students' positive and negative opinions on the technique were also revealed.

Keywords. Cooperative learning, jigsaw method, middle school, geometry, quadrilaterals.

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INTRODUCTION

Every human being uses mathematics in daily life. In spite of this, the perception that mathematics is an abstract science makes it difficult for some students to learn. Traditional pedagogical methods present mathematics as a field of abstract rules and equations distant from daily needs. Perceived in this way mathematics appears unpleasant and cold, like a subject that can only be memorized (Baki, 2014). Nevertheless, mathematics remains an important discipline. Mathematics has been actively used in areas such as language, music, economy, engineering and medicine in systematic and regular ways (Nasibov & Kaçar, 2005). Thus, the importance of knowing and teaching mathematics grow increasingly important day by day.

There is no universal method of instruction that can be implemented for every subject, to every student and at every level. Failing to accommodate this point plays a vital role in the low level of success in many mathematics classrooms (Yıldırım, 2014). Teachers should organize classroom environments that facilitate student communication, encourage students to express their thoughts, make written expressions and discuss with one another. In addition, teachers can provide students with opportunities to develop their communication skills and, at the same time, to learn mathematical notions by leading them to write, read, speak and listen about mathematics (Ministry of National Education / Milli Eğitim Bakanlığı [MEB], 2013). In Turkey's mathematics program, learning mathematics is considered an active process, and students are asked to be active participants during the learning process. That is, the students are held responsible for their own learning. Therefore, classroom environments should be created in a way that students can examine and make research, communicate with one another, express their thoughts freely and generate solutions with different perspectives (MEB, 2013).

Discussing mathematics from different perspectives facilitates the production of new ideas and the formation of connections between them. Individuals participating in activities in which they reach a conclusion or find a solution develop their understanding of mathematics, an understanding that is deepened and refined when they try to persuade their group mates of their solution. Participating in such activities leads students to develop a language for expressing their thoughts on mathematics. Students, who have opportunity, to be encouraged and supported for speaking, writing, reading and listening about mathematics, have two advantages; they communicate mathematically and they communicate to learn mathematics. Performing activities and discussing answers develop students' self and peer-assessment capacity (National Council of Teacher of Mathematics [NTCM], 2000).

Cooperative learning is a technique in which small groups are formed for the purpose of maximizing both students' and their group mates' learning purposes (Johnson, Johnson, & Holubec, 2016). Communication, interaction, and cooperative learning are related to Vygotsky's social constructivism (Efe, Hevedanlı, Ketani, Çakmak, & Efe, 2008). Vygotsky supports his approach with Zone of Proximal Development (ZPD) theory, which posits that individuals alone do not reach the learning levels, achieved with the help of more proficient individual. When students interact with their environment and cooperate with their peers, ZPD emerges and inner developmental processes begin (Vygotsky, 1978). According to Vygotsky, collaboration between children promotes growth because children are likely to be operating within one another's proximal zones of development modeling in the collaborating group behaviors more advanced than those they could perform as individuals. Vygotsky noted that successful problem solvers think aloud about difficult problems. Children in cooperative groups can hear this inner speech out loud and can learn how successful problem solvers are thinking through their approaches (Vygotsky, 1978).

From a motivationalist perspective, cooperative incentive structures create a situation in which the only way group members can attain their own personal goals is if the group is successful. Therefore, to meet their personal goals, group members must both help their groupmates to do whatever enables the group to succeed, and, perhaps even more importantly, to encourage their groupmates to exert maximum efforts (Slavin, 2014). For less successful students, cooperative learning environments can be an alternative instead of competitive learning environments. This can diminish the internalization of failure among such students (Slavin, 1980). A cooperative learning environment is one in which students play an active role, social learning and peer assessment gain importance, students communicate, share and cooperate with each other, and they can discuss and express their thoughts more freely. In such an environment, constructing information can be much easier (Johnson &Johnson, 1999).

Jigsaw is a cooperative learning technique in which student develop knowledge about a given topic and then teach it to others. Jigsaw method is particularly useful for motivating students to learn and process information deeply enough to teach it to their peers. It also gives each student a chance to be in the spotlight. When students assume the role of teacher, they lead the discussion, so even students who are reticent to speak in class must take on leadership roles. This technique is also an efficient strategy for extending the breadth, depth, and scope of learning because students learn and teach multiple topics simultaneously during the same class sessions (Barkley et al., 2014). Subject, summary information about the parts of the study, its equivalence in scientific literature, the

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Cooperative Learning Method

Classes and activities should be constructed considering the basic principles of cooperative studying for students to use cooperative learning. These basic principles are described below:

1. *Positive Dependence*: Positive dependence indicates that all the students in a group fulfill their responsibilities in order that all the members of the group learn effectively (Bayrakçeken, Doymuş, & Doğan, 2015). Example of devices supporting positive dependence are purpose, material, task, award, and role used (Johnson et al., 2016).

2. *Individual and Group Responsibility*: In cooperative learning responsibilities, belong to both individuals and the group. Group should take responsibility for reaching their goals, and each member should be aware of their responsibility to fulfil their share (Johnson et al., 2016).

3. *Group Formation and Group Spirit*: Heterogeneous student groups are formed according to students' success rates. Other important factors to be taken into consideration while forming groups are age, gender, hobbies, and fields of interest (Bayrakçeken et al., 2015).

4. *Face-to-Face Supportive Interaction*: Students should support each other's success by sharing their sources, helping, encouraging and praising one another and eventually they should produce concrete products. Constructive face-to-face interaction emerges from common purposes as well as from promises students give each other help one another teach effectively (Johnson et al, 2016). Students that are reluctant to engage in-class discussion can take part more effectively and comfortably in small group discussions. Students with low rates of academic success can get complementary, supportive and regulatory help from other group members (Bayrakçeken et al., 2015).

5. *Using Social Skills:* Students can acquire social skills such as increasing self-confidence, criticizing ideas, developing empathy, and forming good relationships in well-constructed classrooms. Additionally, they can learn active listening skills, which are also important (Bayrakçeken et al., 2015). Cooperation and conflict are notions that are naturally one within the other, conflict and problem-solving skills are important for the long-term success of cooperative learning student groups (Johnson et al., 2016).

Jigsaw Technique

Designed to aid learning and increase cooperation among students, Jigsaw is a technique developed by Eliot Aronson in 1978.Jigsaw method consists of four main stages (Bayrakçeken et al., 2015):

- Introduction
- Expert Research
- Reporting and Reshaping
- Assessment and Completing

In the introduction stage, the teacher categorizes the class into main groups, and it is important that groups are heterogeneous. Then, teacher introduces the unit, activity or material for the students to study. Each student in each of the main groups is given a part of the material to be studied. The second stage is expert research. At this stage, the teacher gathers together students who are studying the same part of the unit or material into one group and to serve as experts. In their expert groups, students prepare themselves by studying and researching subjects and activities that they will teach when they return their main groups. At the reporting and reshaping stage, students return to their main groups and try to teach the subjects, they researched in their expert groups, to their friends. In the completion and assessment stage, the teacher can prepare an activity for small groups or a whole class activity to integrate students' learning (Bayrakçeken et al., 2015).

Importance of the Study

Face-to-face interaction between individuals is decreasing and students spend less time with each other. The most important part of the cooperative learning methods is that students are in a social environment and interacting with their peers. In this study, an environment in which students can learn together was prepared, making new friends and improving existing friendship. Additionally, students are encouraged to be active through an emphasis on the importance of being active

throughout the learning process. It is hoped that students develop confidence, share what they know and gain cooperation skills. We selected quadrilaterals from the 7th grade geometry curriculum as the subject material for our study. As one of the most frequently encountered shapes, quadriletarels are an example of mathematics prevalent in daily life. The objective of study was to determine whether the Jigsaw technique of cooperative learning methods can be an alternative to traditional teaching methods.

There are numerous studies of different cooperative learning techniques that includes participants at different levels. In some of the studies, cooperative learning techniques are compared to traditional teaching methods. According to Uyanık (2016), Dirlikli (2015), Jack (2015), Mourning (2014), Gülsar (2014), Campbell (2013), Marangoz (2010), Torun (2009), Tarım (2009) , Ural (2007) and Bosfield (2004), it is clear that cooperative learning methods are significantly more effective in learning and increasing success when compared with the traditional teaching methods. According to Harding (2015), Kabuk (2014) and Maden (2011), cooperative learning methods and traditional teaching methods affect the success equally.

In some studies, students' opinions on the cooperative learning methods are examined in addition to the method's effects on success. Some studies by Dirlikli (2015), Jack (2015), Kabuk (2014), Maden (2011), Torun (2009) and Ural (2007) reveal some positive and negative opinions. Some of the positive opinions from these studies are: the method is fun and useful in class, it can be an alternative to the traditional method, it improves friendship, it increases the sense of responsibility, learning is getting easier and students are more successful by sharing information. Some of the negative opinions are: there is noise in learning environment, learning takes a very long time, successful groups are envied and students with low success have some difficulties.

Research Questions

There are two research questions of this study.

1. Is there a significant difference in achievement test scores pertaining to quadrilaterals between the experiment group using the Jigsaw technique of cooperative learning methods and the control group using traditional teaching methods?

2. What are the opinions of the students in the experimental group about their experience of the Jigsaw technique of cooperative learning method?

METHOD

Research Model

We used both qualitative and quantitative research methods in this study. In the quantitative portion, a post-test with control group random experimental method was used. One of the two 7th grade classes was selected as a control group and the other one was selected as an experimental group through random selection method. Traditional teaching methods were assigned to the control group, while Jigsaw technique of cooperative learning was assigned to the experimental group as an independent variable. Students' mathematics test results were assigned as the dependent variable for both groups. In the qualitative part of the study, to reveal the opinions of the students in the experimental group on the Jigsaw method we used, the students were asked four open-ended questions after the activity and they were told that they can answer the questions freely. Then, content analysis was completed on students' answers.

Study Group

The sample of this study consists of students from two different 7th grade classes in a single school. The study was conducted during the 2015-2016 academic year. The distribution of students in the experimental and control groups by gender is given in Table 1 below.

Table 1. *Distribution of Students by Gender*

Gender	Experimental Group	Control Group	Total
Girl	14	12	26
Boy	11	13	24
Total	25	25	50

Results of four mathematics exams administered during the 2015-2016 academic year were taken into consideration to provide equivalence between two groups. To decide whether these two groups are equal, the data can be analyzed by independent samples of using the t-testi. To state the applicability of t-test, it will be taken into consideration the normality of the data and equality of variances across comparison groups. Because n value is less than 50, Shapiro - Wilk test is conducted to determine whether math's achievement test points of two groups show normal distribution and Levene's test is conducted to show that the variances are equal (Büyüköztürk, 2016). Table 2 shows Shapiro -Wilk and Levene test result of two groups' mathematics exams.

Table 2. *Shapiro-Wilk and Levene Test Results of Groups' Mathematics Exams*

Group	Shapiro-Wilk			Levene			
	Statistic	df	p	Statistic	df1	df2	p
Experimental	0.93	25	0.09	0.04	1	48	0.84
Control	0.96	25	0.37				

As for Table 2, according to the Shapiro – Wilk test results, p value is bigger than 0,05 for all groups, the data show normal distribution. Levene's test shows that p value is bigger than 0.05, so variances are equal. For this reason, to decide whether these two groups are equal, the data can be analyzed by independent samples of using the t-test (Büyüköztürk, 2016).The results are shown in Table 3.

Table 3. *T-Test Results of Students' Mathematics Tests in Groups*

Group	N	$\overline{X}$	S	df	t	p
Experimental	25	243. 08	19.29	48	-1.20	0.91
Control	25	225.72	18.62			

According to data presented in Table 3, because the difference between the control and the experiment group students' total mathematics test scores is p>0.05, it is not significant, therefore, the groups are equivalent.

Data Collection Tools

Mathematics Achievement Test. A mathematics achievement test composed of 20 multiple-choice questions about quadrilaterals was developed. The analyses showed that the average difficulty index is 0.52 and the average discrimination index is 0.35. According to the results, the mathematics achievement test is of average difficulty and it is discriminant. The KR20 ratio was calculated to be 0.76. If KR20 is > 0.70, it can be said that the assessment instrument is unidimensional and reliable (Özçelik, 2010).Since KR20 is equal to 0.76, the achievement test is unidemsional and reliable.

Research Questions Form. The students were asked to answer the questions about the technique and implementation by filling the form composed of four open-ended questions. Questions, which were answered by students, are below.

1. What did you do during group work? What did you experience while you are working with the group? Explain it.

2. According to you, what are the positive aspects of group work? Why? Explain it.

3. According to you, what are the negative aspects of group work? Why? Explain it.

4. Is group working beneficial? Which one do you prefer a group work or teacher expression? Why? Explain it.

Content analysis was conducted on the students' answers. The main procedure in content analysis is to categorize similar data under concepts and themes, interprete them and organize them so that readers can understand (Yıldırım and Şimşek, 2013). By coding the sentences, and creating a meaningful whole, a frequency table of sentences was formed and the most frequent responses were identified and interpreted.

Process

In-Class Implementation of Traditional Teaching Methods. For control group, traditional teaching methods were used. The researcher teacher implemented the activities, which were also used by experimental groups, related with quadrilaterals in five-lesson hour. Necessary information about quadrilaterals was given to the students through direct instruction, question-answer activities and discussion, through homework, in which students were introduced the next topic to prepare them for the next class. At the end of lesson, an achievement test was given.

In-Class Implementation of Jigsaw Technique. Before the implementation, basic and expert groups were formed. To organize the groups heterogeneously, the students were sorted by gender and their average mathematics tests scores. The basic groups of five students were formed as three girls and two boys or two girls and three boys. To create the basic groups, the students separated to boys and girls, then, sorted by scores highest to lowest. The boy with the highest score, whom we called B1, was placed in the Group A, and the rest of ranked list B2, B3, etc. were distributed into the groups following the pattern B, C, D, E, E, D, C, B, A, A. The girl with the highest score whom we called G1, was placed in the group E, and the rest of ranked list G2, G3, etc. were distributed into the groups following the pattern D, C, B, A, A, B, C, D, E, E, D, C, B. Table 4 shows the distribution method.

Table 4. *The Method of Distributing Students into the Groups*

Ranking of Girls	Ranking of Boys	Basic Groups				
		A	B	C	D	E
G1	B1	B1				G1
G2	B2		B2		G2	
G3	B3			B3, G3		
G4	B4		G4		B4	
G5	B5	G5				B5
G6	B6	G6				B6
G7	B7		G7		B7	
G8	B8			B8, G8		
G9	B9		B9		G9	
G10	B10	B10				G10, G11
G11	B11	B11			G12	
G12				G13		
G13			G14			
G14						

Expert groups were named rhomboid, rectangle, equilateral, square and trapezoid. In addition, one student from each basic group was placed in each expert group. To make these choices, we ranked students in each basic group, according to their mathematics test scores, giving the student with the highest score of group the code A1, and so on. One student from each group was selected; Table 5 shows, so that the expert group would have approximately equal ability levels.

Table 5. *Method of Forming Expert Groups*

EXPERT GROUPS				
Rhomboid	**Rectangle**	**Equilateral**	**Square**	**Trapezoid**
A1	B1	C1	D1	E1
B2	C2	D2	E2	A2
C3	D3	E3	A3	B3
D4	E4	A4	B4	C4
E5	A5	B5	C5	D5

To raise students' effectiveness, support the group atmosphere and create positive dependence, each member of the group was given some role, namely there was a group leader, one measuring length, one drawing, one measuring angle, and a writer. The classroom environment was organized so that the groups could work freely. For the being expert, the goal of the initial period was to learn about the qudrilateral from which their group took its name. In particular, students conducted activities, prepared by researchers, with their groupmates during a class period in which they try to

make a deduction and learn together mates about the angles, sides and diagonal aspects of their assigned shape. Afterwards, the students returned to their basic groups and taught their group mates about quadrilateral and the activity they learned in the expert group. Finally, they answered the assesment test and questions at the end of the learning activity. Students are given a mathematics achievement test and are awarded performance points according to their scores and the activities they take part in and completed. These performance scores determined who earned the award.

RESULTS

In this section, we have described the result of independent samples of t-test that was used to determine whether there is a significant difference between the mathematics achievement test scores of control and experimental groups. We have reported students' opinions on the Jigsaw technique by using content analysis.

Findings on the First Research Question

To compare the average achievement test scores of students of experimental and control groups, the data can be analysed by independent samples of using the t-testi. To state the applicability of t-test, it will be taken into consideration the normality of the data and equality of variances across comparison groups. Because n value is less than 50, Shapiro - Wilk test is conducted to determine whether maths' achievement test points of two groups show normal distribution and Levene's test is conducted to show that the variances are equal (Büyüköztürk, 2016). Table 6 shows Shapiro -Wilk and Levene test result of two groups'achivement test scores.

Table 6. *Shapiro-Wilk and Levene Test Results of Groups'Achivement Test Scores Z*

Group	**Shapiro-Wilk**			**Levene**			
	Statistic	df	p	Statistic	df1	df2	p
Experimental	0.92	25	0.04	0.05	1	48	0.83
Control	0.95	25	0.26				

Table 6 shows that because p value is bigger than 0,05 for the control group's Shapiro-Wilk test, it can be said that the data show normal distribution. For the reason that p value is less than 0,05 for the experiment group, to determine the data show normal distribution, its skewness and curtosis Z scores are calculated. It can be said that İf skewness and curtosis Z scores' absolute value is less than 1,96 for $p < 0,05$, data of experiment group show normal distribution, (Field, 2009). Table 7 shows the skewwness and curtosis Z scores of experiment group data.

Table 7. *Skewness and Curtosis Z Scores of Experiment Group Data*

Skewness(S)	$SE_{skewness}$	$Z_{skewness}$	**Curtosis(K)**	$SE_{curtosis}$	$Z_{curtosis}$
-0.78	0.46	-1.69	0.06	0.90	0.06

According to Table 7, it can be said that data of experiment group show normal distribution because skewness and curtosis Z scores' absolute value is less than 1,96 for p< 0,05. Thanks to the fact that p value for groups in Table 6 is bigger than 0,05 for Levene's test conducted to see whether the data variances are equal. The data of experiment and control groups show normal distribution and equal variance, therefore unpaired t test can be conducted. The results of the unpaired t test are presented at Table 8.

Table 8. *The Results of T-Test Achievement Test Scores*

Group	**N**	$\overline{X}$	**S**	**df**	**t**	**p**
Experimental	25	13.78	4.39			
				48	2.14	0.04
Control	25	11.08	4.34			

As seen in Table 8, the difference between average achievement test scores of experimental group and control group is p<0.05,it is significant, therefore it can be said that Jigsaw technique is more effective than the traditional teaching methods for teaching quadrilaterals.

Findings on the Second Research Question

The students' answers were coded in terms of the ideas, opinions and messages they contained for the sentences with similar meanings, we created a frequency table of the data shown in (Table 9).

Table 9. *Experimental Group Students' Most Stated Opinions on Jigsaw Method*

Positive opinions	**f**	**%**
1. Group work was fun.	19	76
2. We supported and helped each other.	15	60
3. My friends helped me.	7	28
4. We discussed and learned different ideas.	7	28
5. I helped my friends.	7	24
6. Our friendship strengthened.	5	20
7. I learned what being a team and helpfulness is.	4	16
8. I could not paid attention during a normal class, but I learnt with the group.	4	16
9. We acted with team spirit.	4	16
10.I asked, I learnt, I tried to understand.	4	16
Negative opinions	**f**	**%**
1. There were students who didn't take part in any activity.	7	28
2. I am afraid that I fail the exam.	6	24
3. There were controversies.	4	16
4. It was very noisy.	4	16

According to the students' positive opinions on cooperative learning methods seen in Table 6, the sentence with the highest frequency is "Group work was fun". Seventy-six percent of the students thought that group work was fun. The frequency of "We supported and helped each other." is 15, 60% of all responses. Twenty- eight percent of the students used the statements "My friends helped me." and "We discussed and learned different ideas. "While 24% of the students used the statement, "I helped my friends. Twenty percent of the students used the statement "Our friendship strengthened."

Among the positive opinions, the statements "We acted with team spirit", "I asked, I learned I tried to understand.", "I couldn't paid attention during a normal class, but I learned with the group." and "I learned what being a team and helpfulness is." appeared four times, 16% of students used one of these statements. The most common negative statement was "There were students who didn't take part in any activity." Seven students, equal to 28% of the total, expressed this view. Twenty-four percent of students reported, "I am afraid that I fail the exam." Four students, equal to 16%, indicated "There were controversies.", and 16% of students complained, "It was very noisy."

When asked, "Do you think the group work is beneficial?", 84% of students said "Yes" and, %12 of students said "No". One student was neutral. Eighty- four percent of experimental group found the group work beneficial. When asked "Which one do you prefer: Group work or teacher

should lecture?" sixty percentage of students choose "group work", seven students choose "teacher should lecture" and three students stay neutral. According to our assessment of the student opinions, 60% of students participating in the study preferred group work.

DISCUSSION AND CONCLUSION

The difference between the success rates on a 7th grade mathematics subject, quadrilateral, of experimental group with Jigsaw technique and control group with traditional teaching methods is significantly in favor of experimental group. This result is supported by studies of Uyanık (2016), Dirlikli (2015), Gülsar (2014), Mourning (2014), Campbell (2013), Marangoz (2010), Tarım (2011), Torun (2009), Ural (2007) and Bosfield (2004). Ultimately, for quadrilaterals, the Jigsaw technique was more effective and it can be an alternative to the traditional teaching methods.

The analyses of students' responses to research questions about the Jigsaw methods indicate that the positive opinions with the highest frequency are; the cooperative learning environment is fun, it is preferable as a learning method, they can think effectively, it improves cooperation and friendship, and they help each other to learn. Negative responses about the method are; some students not participating in any activity, exam anxiety, excessive noise and controversies.

The most frequent opinions and answers from students suggest that most students find the Jigsaw technique entertaining and they prefer it to traditional teaching methods. In addition, the technique contributed to the skills of learning by helping and discussing, friendship and being a team. Enjoyment in learning increases the interest in subject improving the scholastic performance. In Jigsaw cooperative learning strategy students tends to enjoy mathematics and this enjoyment motivates them to learn mathematics effectively (Rao, 2016). Fun learning environment had an impact on the success of the experimental group.When the views of students about the method are examined, the frequency of concepts such as solidarity, teaming and negotiation is high. Considering that these concepts are the basic elements of cooperative learning, it is obvious that cooperative learning was working effectively in this study. This situation can be considered as another important factor in increasing success. An advantage of the jigsaw classroom lies in the fact that each student has the role of an expert, and they can see themselves as a competent member of the class. Critical group of students with a low academic self-concept felt clearly more competent than in the traditional teaching setting (Hänze, & Berger, 2007). In accordance with this, the fact that students with low

success had an expert role and feel as part of the class and team may have increased the success of the experimental group in this study.

Though some students were afraid of exam, this can be seen as an indication of group responsibility and can considered positive side of method. Furthermore, controversies can contribute to students' problem solving skills and, consequently, can be seen as another positive feature of the Jigsaw method.

Recommendations

Recommendations on Pedagogy.

- The Jigsaw technique can be used to improve student outcomes for learning quadrilaterals
- Teachers and candidate teachers should have more information on the Jigsaw technique and use it more often.

Recommendations for Researchers.

- Students returning back to their basic groups from the expert group can be organized into groups of two or three to review what they learned and, in this way, mislearnings can be prevented.
- To give students team awareness before the activity, various games and activities can be organized for the teams
- To get students accustomed to the Jigsaw technique before the activity, more pilot activities can be implemented. Because some students struggled to adapt to group work and friends in the own group
- During the activity, the level of active student engagement, interaction with their teammates as well as how much they communicate can be recorded in-class observation forms. The results can be correlated to the observation data. Accurate results might require assistance from another researcher.
- Because 7th grade students have some difficulties on expressing their opinions and feelings, a likert scale questionnaire could be used to reveal their opinions on the method instead of free response survey.

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There is no conflict of interest in relation to this work.

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