

Effect of Subject Jigsaw and Reading Writing Presentation Techniques on Academic Achievement of 6th Grade

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ABSTRACT

In this article a recently developed method, Reading Writing and Presentation (RWP) is introduced and compared with Subject Jigsaw Method (JG) and Control Group (CG). Research was carried out with 68 6th grade elementary school students. Number of students included in RWP group was 26, in JG was 20 and in CG was 22. Pretest, posttest and semi-experimental design used in this research. Before the experimental practice all the students were given pretests. Pretest results revealed that RWP group had statistically significant academic achievement than CG. After implementing the practice, students were given posttests and, both RWP and JG group statistically had better achievement than CG. Students also were given a technique view form. Results revealed that RWP is a useful method in developing social and cognitive skills. It is also concluded by the study that constructivist designed curriculums supported with Cooperative Learning Methods increase academic achievement and students gain positive social skills.

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Introduction

Increasing knowledge has led advances in all areas. Thus, countries' need for qualified individuals has increased and through education, it is aimed that number of qualified individuals will increase (Al Mamun Bhuiyan, 2020; Fooladvand & Yarmohammadian, 2011; Hübner, 2012). The need of qualified individuals has also alerted families and as a consequence, families are now also in demand of qualified schools (Woodhead, Frost & James, 2013). Schools are responsible to fulfill those demands. However, this responsibility also means every student must learn and their needs should be taken care of. For that reason, diversity of students (individual differences) should be taken account in educational settings (Cary et al., 2020; Nilsson & Driel, 2010). In that aspect, science education should teach the students the way of scientific thinking and students should have scientific thinking skills. That purpose might be achieved by using modern instructional techniques (Metin, Acisli & Kolomuc, 2012). Students who use scientific thinking skills have better academic achievement than students who do not. Thus, instructional methods which set in motion the scientific thinking skills are widely used (Bartholomew et al., 2018; Talebi et al., 2011). Additionally, scientific thinking skills are in positive linear relationship with critical thinking skills. Thus, it also supports creativity in students (Irwanto, Rohaeti & Prodjosantoso, 2019). For example, Batlolona et al. (2019) noted that learning is associated with creativity and it is supported by scientific thinking skills. Active learning methods support this purpose and for that reason it is widely used.

Cooperative Learning Methods

Studies have revealed that pedagogy and curriculum which are supported by active learning methods help students to comprehend the material better and make better connections with previous learning (Dimick, 2012; Seiler & Gonsalves, 2010). Consequently, learning become more meaningful (Buxton, 2010) and mis-learning is corrected (Abdullah et al., 2018; Dimick, 2012). Cooperative learning model has many techniques which support active learning. Studies indicate that cooperative learning model helps students to develop their own scientific knowledge thinking skills through discussions which happen between the students in small groups (Wang et al., 2012; Dewi et al., 2021). Teachers reach students through small groups and inequality between students decrease since they have the opportunity to spend more time with teacher (Cho, Glewwe & Whitler, 2012). In cooperative groups, students are active learners who take their own responsibility for studying, collaborating and sharing the knowledge with each other. Teachers have more time to walk between the groups and observe the students and their studies. Teachers have more opportunity to discuss with students and that created harmony turns into an active continuous interaction between the students and teachers. That interaction creates a transition of the teachers' role from an instructor to a guide (Akçay et al., 2012; Doğan et al., 2010; Warwick et al., 2010). In addition, teachers have the opportunity of getting continuous feedback from their students. Obtaining feedbacks from students could enhance effectiveness of the exams and instructed curriculum (Otkun et al., 2003). Moreover, increasing student-teacher interaction improves students' logical thinking abilities (Jong-Yoon et al., 2006). Effectiveness of student feedbacks has led scientists to develop artificial intelligence software which aims and helps to increase the academic and education standards of institutions (Krishnaveni, Pai & Iyer, 2017).

Subject Jigsaw

Cooperative learning method supports diversity and individual differences. Due to that fact, researchers develop new methods and introduce them to scientific world. One of the recently introduced techniques is Subject Jigsaw which was developed by Doymus (2008). Subject Jigsaw (JG) technique applied by many researchers and its effectiveness on developing better social relationships and achieving academic success were discussed by some published papers. For example, Sezek (2013) acknowledges that technique is useful in teaching the materials which is defined as "hard to understand" by the students. Similar arguments were also proposed by other researchers (Doğan, et.al, 2010; Haviz & Lufri, 2019; Şimşek et.al., 2009).

Reading Writing and Presentation

Since cooperative learning methods create opportunity to develop methods, researchers develop new techniques and introduce them. One of the recently developed techniques is Reading Writing and Presentation (RWP) or Reading Writing and Application (RWA) technique (Aksoy, 2011). Naming of the technique depends on the way how the method was used in the classroom. Philosophical principles and application of the RWP will be outlined below.

Reading is simply a dialogue between the text and reader. Thus, it houses the social interaction between words and readers. Consequently, RWP supports cognitive dialogue. Students tend to think that information might be heard from the teacher and teachers unintentionally support students' thinking during the learning process in classrooms. A dialogue between the text and students helps them to understand that words bring more than themselves (Laurent & Martinot, 2010), and through that cognitive development happens via textbooks or any other written media (Vanbecelaere et.al., 2020). Reading consists of decoding the words and interpretation. Thus, it is also the base of learning and comprehension on the issue. When that point was missed, it is no longer surprising to see the individuals having higher degrees and yet, exhibit ignorance (Wolff, 2010).

Students encounter more stimulants through unfamiliar words while reading which enhances their comprehension on the issue (Spear-Swerling, Brucker & Alfano, 2010). Through the text, reader visualizes the written scene in his/her mind and motor reflexes of the brain are stimulated. Neurological studies indicate that left side of the brain is activated during reading. For example, studies indicate that adults' left hemisphere of the brain is more activated than children, which is a result of adults' reading capacity (Hruby & Goswami, 2011).

Reading can not be defined alone as one's ability of reading or understanding the written text. In fact, it is more complex and as the encountered complexity increases, thus the one's comprehension ability (Nation, 2017). Yet, some teachers misunderstand this fact and try to measure students' comprehension by reading a specific text within a specific time. Consequently, such activities turn reading into a race and as a result, students read a written passage without understanding it (Fountas & Pinnell, 2012). In order to stimulate left hemisphere and increase the comprehension level, RWP technique allows students to pace on their own speed. Each reading material is provided by the teacher to avoid possible initial frustration of complexity of the written text. If any of the students finishes before the expected time than his/her group mates, extra reading materials are provided by the teacher in order to keep the group in harmony within itself (Aksoy & Doymuş, 2011). Based on the information stated above, RWP is built on reading activities and integrates them into cooperative learning method. This technique is named as Reading Writing and Presentation (RWP) and first introduced by Aksoy (2011). In this context, purpose of this study is to determine effectiveness of JG and RWP techniques on academic achievement of 6th year elementary school students in matter and heat unit.

Problem state of the study is;

Is there any difference in effectiveness between RWP, JG and current curriculum instruction in increasing the students' achievements in the concept of matter and heat?

And the sub problems of the study are;

1. Does subject jigsaw technique (JG) make statistical significant difference in academic achievement of 6th year elementary school students in matter and heat unit with respect to current curriculum instruction (CG)?
2. Does reading writing and presentation technique (RWP) make statistical significant difference in academic achievement of 6th year elementary school students in matter and heat unit with respect to current curriculum instruction (CG)?
3. Does reading writing and presentation technique (RWP) make statistical significant difference in academic achievement of 6th year elementary school students in matter and heat unit with respect to subject jigsaw technique (JG)?
4. What are the views of students in the groups related to instruction techniques?

Methods

Research Design

This study was carried out with respect to quantitative research methods. Study design was pretest, posttest and semi experimental design. This design is used to determine the effect of a variable on the concerned issue. This design is helpful when there is no possibility of controlling all the effective factors upon the concerned issue (Karasar, 2005). Since the purpose of the study was to determine the effect of different cooperative learning methods on the student achievement, different instructional techniques set as variables. Concerned variable was the academic achievement and for that reason, a pretest was applied in order to determine the prior academic knowledge level difference between the groups. Through that, it was aimed to analyze the effect of the methods on the academic achievement.

Study Group

Three different 6th grade classrooms were randomly selected for the study. One classroom randomly selected as Reading Writing and Presentation (RWP) group while other group randomly selected as Subject Jigsaw (JG) group and last group was selected as control group (CG). RWP group consisted of 26 students, JG group consisted of 20 students and control group consisted of 22 students. Thus, total number of students enrolled in the study was 68. % 47,3 percent of students were girls and % 52,7 of students were boys. Thus, gender distribution was approximately even for both genders. Before the study, all groups were given pretest in order to determine their academic knowledge level difference between each other.

Data Collection Tools

Pretest

Pretest questions were selected from the questions which were asked in text books and nationwide elementary school exams. Purpose of pretest was to determine students' present academic knowledge level. For that reason, 30 questions were selected from the previously learned topics for the pretest and then, experts' and elementary teachers' views were taken on the prepared multiple choice test. Experts were academicians from two different universities who have both publications and education on the elementary school education topic. Teachers were elementary science teachers who were working actively. For pilot analysis, draft pretest was applied to 28 students studying 6th grade level. After the analysis, five questions were removed from the pretest since they lowered the internal reliability of the pretest. Thus, number of questions reduced to 25 for the pretest. KR-20 value of the pretest was .77.

Posttest

Posttest questions were selected from the questions which were asked in text books and nationwide elementary school exams. 30 questions related to matter and heat unit were selected for the posttest. Purpose of posttest was to determine students' academic knowledge level on matter and heat unit. For that reason, experts' and elementary teachers' views were taken on the prepared multiple choice tests. Experts were academicians from two different universities who have both publications and education on the elementary school education topic. Teachers were elementary science teachers who were working actively. For pilot analysis, draft posttest was applied to 39 students studying 7th grade level. After the analysis, five questions were omitted from the posttest since they lowered the internal reliability of the posttest. Thus, final number of questions reduced to 25 for the posttest. KR-20 reliability value of the posttest was .88.

Instructional Method View Form

A semi-structured interview form was prepared and a pilot study was carried out with 10 elementary school students. Both scaled and open interview questions were directed to students about the instructional methods. Based on responses of the students, a draft semi-structured instructional method interview form was prepared. Opinions of experts who have publications on cooperative learning method were taken upon the draft interview form. After feedbacks, the draft form was finalized as instructional technique interview form.

Procedure

Curriculum and instructional materials followed in the classrooms were the same for all the groups as indicated in Turkish Science Education Program. Thus, weekly course hours, coverage of topics etc. were same for all the groups. The only difference between the groups were the implemented study methods. Students studied the material with their elementary science teacher.

Procedure for Control Group

All the instruction, sub-unit order, materials and experiments were carried out by the classroom teacher with respect to present constructivist curriculum (CG) as indicated in Turkish Science Education Program. After completing the matter and heat unit, posttests were applied to students.

Procedure for RWP group

RWP consists of three phase. Each phase was explained in detail. First phase consisted of reading phase. In reading phase students were given reading materials related to topics. Each student read the material. Teacher allocated enough time for the groups to finish the reading part.

After reading phase groups passed into writing phase. This was the second step of the RWP. Groups were responsible to write their group reports. All the students in the groups contributed to the written reports. After finishing the reports, groups presented their reports to teacher. Teacher carefully examined the written report and informed the group about missing points in their report and send it back to group to correct the problems and finalize the reports. Groups corrected their reports and again presented to teacher. If there was no issue on the report then group passed to step three which was presentation.

In step three, presentation, groups presented their reports to the whole classroom. If the predetermined time was not enough for all the groups to make the presentations; in that case, the teacher or one of the students drew lot to choose to groups for presentations. After presentations, students were given achievement tests (posttest).

Procedure for JG Group

JG consists of several phases. Each phase was explained in detail. First phase consists of choosing topic leaders. Each student in the groups was assigned to a topic randomly by their teacher. Then, students who choose the same topic came together and established a new group which was called as expert group. Students in the expert groups studied together and learned the material covered. Process of each group was observed by the classroom teacher. After finalizing study, each expert returned to their original groups. In last phase, expert students acted as teachers and studied with their group mates on the subject matter. All the groups finished their study and posttest was applied to students.

Findings

Pretest Results

Descriptive statistics of pretest results were presented in Table 1.

Table 1*Descriptive Statistics of Pretest Results*

Groups	n	X	SD
CG	22	38,18	12,389
JG	20	42,40	15,702
RWP	26	58,31	16,864

Data in Table 1 indicated that JG group mean was higher than CG. Same data indicated that RWP group mean was higher than both CG and JG group. To determine if there was a statistical significant difference between the groups, one-way ANOVA test was applied. Results of one-way ANOVA test were presented in Table 2.

Table 2*One-way ANOVA Pretest Results*

Groups	Sum of Squares	Df	Mean of Squares	F	p
Between groups	5457,448	2	2728,724	11,811	0,001
Within groups	15017,611	65	231,040		
Total	20475,059	67			

Data in Table 2 revealed that there was a statistical significant difference between the groups ($F(2,65)= 11,811$; $p < 0,05$). In order to determine which group had statistical significant difference, LSD post-hoc test was applied and test results were presented in Table 3.

Table 3*LSD Test Results of Pretest*

(I)Groups	(j) Groups	Mean Difference (I-J)	Standard Error	p
CG	JG	-4,218	4,696	0,372
	RWP	-20,126*	4,403	0,001
JG	CG	4,218	4,696	0,372
	RWP	-15,908*	4,521	0,001
RWP	CG	20,126*	4,403	0,001
	JG	15,908*	4,521	0,001

Data in Table 3 revealed that there was a statistical difference between RWP group with CG in favor of RWP group. Also test results indicated that there was a statistical difference between JG and RWP group in favor RWP group. Lastly, there was no statistical difference between JG and CG.

Posttest Results

After the study, posttests were applied to the students and descriptive statistics of posttest results were presented in Table 4.

Table 4*Descriptive Statistics of Posttest Results*

Groups	N	X	SD
CG	22	29,64	8,063
JG	20	44,00	15,190
RWP	26	63,42	16,872

Data in Table 4 indicated that JG group mean was higher than CG. Same data indicated that RWP group mean was higher than both CG and JG group. To determine if there was a statistical significant difference between the groups, one-way ANOVA test was applied. Results of one-way ANOVA test were presented in Table 5.

Table 5*One-way ANOVA Posttest Results*

Groups	Sum of Squares	Df	Mean of Squares	F	P
Between groups	13822,254	2	6911,127	34,917	0,001
Within groups	12865,437	65	197,930		
Total	26687,691	67			

Data in Table 5 revealed that there was a statistical significant difference between the groups ($F(2,65)= 34,917$; $p< 0,05$). In order to determine which group had statistical significant difference, LSD post-hoc test was applied and test results were presented in Table 6.

Table 6*LSD Test Results of Posttest*

(I)Groups	(j) Groups	Mean Difference (I-J)	Standard Error	p
CG	JG	-14,364*	4,347	0,002
	RWP	-33,787*	4,075	0,001
JG	CG	14,364*	4,347	0,002
	RWP	-19,423*	4,184	0,001
RWP	CG	33,787*	4,075	0,001
	JG	19,423*	4,184	0,001

Data in Table 6 revealed that there was a statistical difference among RWP group, CG and JG group in favor of RWP group. Also, data in Table 6 revealed that there was a statistical significant difference between CG and JG in favor of JG group.

Analyses of Technique View Form Results

Students' ideas on working in cooperative groups was presented in Table 7; characteristics distinguished by students in themselves after working in cooperative groups was presented in Table 8; understanding their levels on different areas was presented in Table 9; students' views on working with friends was presented in Table 10; students' views on their work effort in cooperative groups was presented in Table 11; will of becoming group leader was presented in Table 12; students' views on learning by themselves without help of teacher was presented in Table 13 and students' preference on next cooperative group work was presented in Table 14.

Table 7*Students' Views on Working in Cooperative Groups*

Views	JG	RWP
Fun	3,2	3,2
Informative	3,7	4,1
Helpful	3,5	3,6

Note. Scores are based on 5 point scale

Students stated that working in cooperative groups was fun, informative and helpful.

Table 8

Characteristics Distinguished by Students in Themselves After Working in Cooperative Groups

Views	JG	RWP
I understand topic material very well	3,9	4,3
My self-confidence increased	4,0	4,1
My perspective enlarged	3,9	4,2
I achieved so many things on my own	4,3	4,8

Note. Scores are based on 5 point scale

Students stated positive ideas on characteristics distinguished in them.

Table 9

Understanding Their Level on Different Areas

Working area	JG	RWP
Problem solving	4,0	4,5
Preparing written documents	4,4	4,6
Making speeches	4,3	4,5
Working in group and with other groups	4,0	4,2
Organizing and planning	4,2	4,4
Efficiency on time management	4,1	4,1

Note. Scores are based on 5 point scale

Students stated positive views on their understanding level of different areas.

View Form Results

Table 10

Students' Views on Working with Friends

Views	JG	RWP
Very good	26,9	35,7
Good	37,7	42,9
Enough	0,0	0,0
Bad	22,6	7,1
Very bad	12,8	14,3

Note. Scores are based on percentile

% 64,6 of JG and % 78,6 of RWP students think that working in cooperative groups was good. However, 35,4 % of JG and 21,4 % of RWP students think working with friends wasn't good.

Table 11

Students' Views on Their Work Effort in Cooperative Groups

Views	JG	RWP
Very good	53,4	64,3
Good	24,2	21,4
Enough	12,3	7,2
Bad	7,5	7,1
Very bad	2,6	0

Note. Scores are based on percentile

% 89,9 of JG and % 92,9 of RWP students have positive ideas about their work effort. However, 10,1 % of JG and 7,1 % of RWP students do not have positive ideas about their work effort.

Table 12*Will of Becoming Group Leader*

Views	JG	RWP
Yes	50,8	69,2
No	49,2	30,8

Note. Scores are based on percentile

Almost half of JG students wanted to be group leader in the next cooperative work session. Almost three-fourths of RWP students wanted to be group leader in the next cooperative work session.

Table 13*Students' Views on Learning by Themselves Without Help of Teacher*

Views	JG	RWP
A lot	39,3	42,9
Some	43,7	50
Very few	14,4	7,1
Not at all	2,6	0

Note. Scores are based on percentile

% 60,7 of JG and % 57,1 of RWP students stated that they needed help of teacher in learning.

Table 14*Students' Preference on Next Cooperative Group Work*

Views	JG	RWP
Studying other courses	64,8	71,4
Using time efficiently	55	50
Making better job-share with group mates	67,1	85,7
Making research from more sources	59	50

Note. Scores are based on percentile

% 64,8 of JG and % 71,4 of RWP students stated that they wanted to work in cooperative groups in the other courses. % 55 of JG and % 50 of RWP students stated that they wanted to use time efficiently in the next cooperative work sessions. % 67,1 of JG and % 85,7 of RWP students stated that they wanted to make better job-share in the next cooperative work sessions. % 59 of JG and % 50 of RWP students stated that they wanted to make research from more sources in the next cooperative session.

Results, Discussion and Conclusion

JG and CG Comparison

Pretest results of subject jigsaw (JG) and control group (CG) indicated that JG group mean was 4,22 point higher than CG (Table 1). On the other hand, statistical analyzes revealed that this difference was not significant and groups had similar prior academic knowledge level (Table 3). For

that reason, it may be said that any statistical difference after the study occurred due to applied instructional techniques. Analyzes of posttest results indicated that JG group mean was 14,36 point higher than CG (Table 4), and that difference was statistically significant in favor of JG (Table 6). In the light of these results it might be said that, although Ministry of Education in Turkey designed elementary school curriculums with respect to constructivist approach, increase in JG mean scores indicated that curriculums supported with subject jigsaw technique created more meaningful learning for the students. Literature covers studies revealing similar results indicating that students benefit from the JG method (Doymuş, 2008; Haviz & Lufri, 2019; Karacop, 2017; Sezek, 2012; Şimşek et al., 2009). Further discussion on RWP technique and data analyzes of RWP will reveal more insight about cooperative learning methods.

RWP and CG Comparison

Pretest analyzes revealed that RWP group mean was higher 20,13 point than CG (Table 1). Statistical analyzes also revealed that this difference was significant and in favor of RWP group (Table 3). Thus, it might be said that students in RWP group were academically more successful than CG. There might be several reasons for indicated academic knowledge level of the students. Motivation towards learning, previous learning, study routine, economic status of families, education level of parents, physical conditions of the classrooms might be the reasons for academic knowledge level difference (Bas, Senturk & Cigerci, 2017; Borekci & Uyangor, 2018; Cvencek et al., 2018; McKenzie, 2019). Be that as it may, posttest analyzes revealed that RWP had increased the mean point difference up to 33,79 point with CG (Table 4). Statistical analyzes also revealed that this difference was significant (Table 6). Based on these results, it might be said that constructivist designed curriculum supported with RWP technique increased students' academic achievements and students' comprehension on the covered materials, and RWP group continued its academic achievements. Although RWP is a newly developed technique, its success on increasing students' academic achievements was output of some studies (Koc, 2014; Koc et al., 2016; Okur Akcay & Doymus, 2014). Further discussions made on both JG and RWP will reveal more insight.

RWP and CG Comparison

Pretest results indicated that RWP group mean was higher than JG by 15,91 points (Table 1) and that difference was statistically significant (Table 3). Pos-test results indicated that RWP group students increased mean difference with JG up to 19,42 points (Table 4) and that difference was statistically significant in favor of RWP (Table 6). Thus, it may be said that RWP technique helped students to continue their academic achievements, and increased the academic achievements of students in RWP group. When both techniques were analyzed together, it was observed that subject jigsaw technique created a mean difference of 10,14 points against control group (Table 1 & Table 4). On the other hand, RWP technique created a mean difference of 13,66 points against control group (Table 1 & Table 4). Moreover, RWP technique demonstrated 3,51 points mean difference against subject jigsaw technique. As discussed above JG technique is a successful technique for increasing students' academic and social skills. On the other hand, being a newly developed technique, RWP provided more mean difference than JG. Within our knowledge, only three study compared RWP's effectiveness against JG method. Gürbüz, Şimşek and Berber (2015) made a similar study in teaching social sciences for the 6th grade students. They used four methods including RWP, JG, group research and present method. However, researchers stated that none of the groups made a significant statistical difference in academic achievement. Another study was carried out by Akdağ and Şimşek (2019). Both RWP and JG method had their success when compared with present curriculum. However, no statistically significant difference found by the researchers. Lastly, Koç et al. (2016) compared effectiveness of JG, RWP and computer supported animations to determine the effectiveness of the methods. Researchers stated that no statistical significant difference was found between JG and RWP

groups. Thus, based on this study, it may be said that RWP technique is an efficient technique alongside JG, helps students to continue their academic achievements and increased the academic achievements of students in RWP group. There were a few researches which included RWP and made similar assessments with this study (Aksoy & Doymuş, 2012a; 2012b; Şimşek, 2013; Şimşek, Yılar & Küçük, 2013).

Students' Ideas Upon the Methods

Students' ideas about implemented techniques would provide better insights and comparison opportunities. Students indicated that working in cooperative learning methods was fun, informative and helpful (Table 7), and they comprehended topic materials better, enlarged their perspectives when encountered with different ideas, had the pleasure of achievement and felt the increase in their self-confidence (Table 8). Studies indicate that in classrooms, in which cooperative learning methods were successfully applied, there are some indications such as, students take self-responsibility (Table 11), work in harmony with group mates (Table 10), and develop better cognitive and affective skills (Table 9). Findings of this study are consistent with literature which indicates positive social and cognitive effects of cooperative learning methods on the students (Dagoc & Tan, 2018; Rahayu & Nugraha, 2018; Raviv, Cohen & Aflalo, 2017; Yılar & Şimşek, 2016). Both creating positive attitudes towards learning and allowing students to construct their knowledge, cooperative learning method is helpful to students. For example, Chowdhury et al. (2020) note that success of students has a positive relationship with students' attitudes towards learning environment. Fernandez-Gonzalez and Franco-Mariscal (2021) indicated that cooperative learning methods helped 8th grade students to learn plant kingdom and have better academic achievements.

Implications of the Study

For a successful cooperative classroom, it is important that students realize their self-responsibility and behave in that manner (as indicated in Table 12 & Table 14). However, it should be noted that teachers' role is important in a successful classroom since students will still need the guidance of teacher (as indicated in Table 13). Literature indicates that success of cooperative learning methods happens if elements of cooperative learning (guidance of teachers, making students to realize their individual responsibilities etc.) run into work as supposed. On the other hand, in classrooms where teachers fail to play the role of guidance, cooperative groups simply turn into group works in which everyone is only responsible for his/her own learning. In that case, social and cognitive benefits of cooperative methods were not achieved and may cause catastrophe in desired outcomes (Buchs et al., 2017; Ebrahim, 2012; Ferguson-Patrick, 2018; Gelici & Bilgin, 2011; Goodyear, 2017;; Şimşek, 2005; Ünlü & Aydın, 2011).

Recommendation and Limitation

This study was only carried out on one curriculum unit with a relatively small sample. This study is limited with 6th grade elementary school students. Thus, a longitudinal study could be carried out with a bigger study group.

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