Investigation of the Effect of Different Teaching Methods on Students' Engagement and Scientific Process Skills*

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Abstract

The aim of this study is to compare the effects of using different teaching methods in "Cell and Division" and "Force and Energy" units on students' engagement in the lesson and scientific process skills. In each of the five randomly selected groups, the lessons were taught with Multiple Intelligence, Problem Based Learning, Peer Instruction, Combined and the method proposed by MONE (2017). In the research, quasi-experimental method, one of the quantitative research approaches, was used. The sample of the study consists of 185 seventh grade students studying in two secondary schools in Yakutiye district of Erzurum province. As a data collection tool in the research; Student Engagement Scale and Scientific Process Skills Test were used. As a result of the analysis, statistical difference was determined in the engagement levels and scientific process skills of students studying in different groups. In terms of the variable of engagement to the lesson, a significant difference was statistically determined in favor of the groups in which Peer Instruction and Combined Method were used. Also in this study in terms of scientific process skills, a statistically significant difference was found in favor of Problem Based Learning and Combined Method groups.

Keywords: Students Engagement, Scientific Process Skills, Problem Based Leaning, Peer Instruction, Multiple Intelligence, Combined Method

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INTRODUCTION

Today, the development of technology at a dizzying pace has increased the importance of science (Grunberg & Grunberg, 2011). In this respect, many countries attach special importance to science teaching in order to be a leader in technology or to maintain their superiority (Ayas, 1995; Elçiçek, 2016; Ünal, 2003). There are many reasons for this situation. These; The first is the continuous development, change and expansion of information as a result of developments in science and technology. Accordingly, the scope of science has reached a wide range and diversity (Giacomelli & Giacomelli, 2005). Second, some science subjects include abstract spaces that we can only feel with our intuition. The third is the discovery of new disciplines that human beings were not aware of, and the interpretation of the universe from a new perspective (Gülseçen, 2002; Taşcan & Ünal, 2015). Fourthly, people make judgments about a subject by blending their own opinions with the beliefs and opinions of the society they live in while learning. Accordingly, human beings can sometimes interpret natural phenomenons correctly and sometimes incorrectly. This situation appears as misconceptions in educational literature (Bozdoğan, 2009; Halim et al., 2018; Selvi & Yıldız, 2009). Fifth, every person has many innate abilities. This causes them not to perceive and learn every topic in the same way. This situation makes it compulsory for people to receive education in the areas they love, care about, learn easily, be successful and be talented (Ayverdi & Aydın, 2020).

Considering all these reasons, it is concluded that it is both impossible and unnecessary for a person to learn everything. This situation make it necessary to change the understanding of education. Since we can't teach everything, the shortest and rational way is to teach people how to learn (Çakır & Sarıkaya, 2018). Constructivist approach comes to the fore in this regard. This approach is to shape the new information that the individual has learned with the knowledge and experiences in his own cognition. In this context, in the constructivist approach, the student will be active and at the center of learning activities in the learning process (Alavi & Dufner, 2005). In this approach, the teacher is the guide who actively manages the learning activities of his students. In other words, from a teacher-centered approach to a student-centered education approach has switched. On the other hand, this situation forces students to learn better. Because, they learn not only scientific concepts but also their relationships. Realization of these conditions causes students to participate actively in class activities (Erbaş & Demirer, 2019).

On the other hand, in the subjects that students have difficulty in understanding, their interest and engagement in the lesson decreases. Active learning methods should be used to prevent this situation (Türkben, 2015). Thanks to active learning methods, students who assume their own learning responsibilities can perform high level learning by participating actively in class activities (Bonwell & Eison 1991; Keyser, 2000). In this regard, students with a high level of engagement will be purpose-oriented, constructive and active, in constant communication with their social and physical environment during their teaching activities.

The engagement of students in the lesson basically includes four dimensions. These are behavioral, emotional, cognitive and agentic engagement. Behavioral engagement is related to the observable features of the students in the lesson. In addition to, students' behaviors such as answering the questions posed to them, asking questions, complying with the rules, participating in activities are associated with this engagement dimension (Fredericks et al., 2004). Emotional involvement is related to the student's feelings. Fears, anxiety, love and desire of the students are related to this engagement. (Fredericks, Blumenfeld & Paris, 2004; Reeve & Tseng, 2011). Cognitive involvement is associated with the student's uses mental processes in accordance with the objectives of the lesson. It is about this engagement dimension that students solve problems, create original strategies and make plans. (Young, 2007). Agentic engagement is reinforcement activities that the student performs during the teaching activities (Reeve & Tseng, 2011). Students' expressing their own opinions on the subject, having a positive contributions to the lesson is an example of this engagement (Reeve, 2012; 2013). Considering that the above mentioned engagement types have a positive relationship with each other,

it can be said that the possible increase in one type of engagement increases the other types of engagement (Hıdıroğlu, 2014; Li & Lerner, 2013; K, 2016; Reeve, 2013; Reeve & Tseng, 2011).

On the other hand, students can learn the main reasons underlying the events instead of learning the subjects by memorizing many formulas and numbers. In such a case, they can apply their knowledge to other events and situations. In this respect, instead of memorizing formulas and solutions, they learn where they come from and how they can be transformed. In this way, they can see the interconnections between events and apply a knowledge to different situations. Thus, they do not have to grapple with a pile of information to memorize (Aldemir & Kermani; Büyükcengiz, 2017; Celep & Bacanak, 2013; Yenice, 2019). This will also contribute the development of students' research skills scientifically to. In this respect, the methods and technical knowledge of their related to research process of students with improved research skills will improve. As a result, scientific process skills, which have an important place in education today, will be gained to students (Deveci, 2018; Yurt, 2013). Scientific process skills basic and high level skills as are divided into two. Students with basic skills; while having the skills of observation, classification, establishing space-time relationship, making predictions and inferences; Students who have high level skills can analyze the events they encounter to the finest detail and make scientifically logical synthesis using skills such as problem determination, hypothesis, determining variables, controlling, designing an experiment and interpreting data (Aydoğdu, 2014).

On the other hand, countries compete with each other in the field of education in order to maintain their development and to train better qualified personnel. Therefore, the general trend in worldwide, we have see that focuses on the skills to use the information. One of the best examples of this is the PISA exam, a worldwide educational project of the "Economic Cooperation and Development Organization" (OECD). This exam has been held in three-year periods since 2000 and aims to measure the science and mathematics literacy and reading skills of students in the age group of 15 (OECD, 2014). Another example is the TIMSS exam, an international educational achievement assessment project. This exam measures knowledge and skills of mathematics and science 4th and 8th grade students. In this respect, the quality of the education systems of the countries is determined with this exam held every 4 years (OECD, 2016). The PIRLS exam is a Development Project in International Reading Skills. It is applied to 10-year-old students every five years. In these exams are also applied questionnaires about students' motivations, opinions about themselves, learning styles, school environments and their families (TIMSS & PIRLS International Study Centre, 2016). In short, if we want to improve the quality of our education system, the training methods we apply should teach many gains that we have mentioned and not mentioned above.

Considering all these variables, the necessity of developing students in many ways emerges. In this respect, it is important to raise individuals who actively participate in teaching activities and who have acquired scientific process skills. Considering this stated importance, the purpose of this study is to examine the effects of using different teaching methods on students' class engagement and scientific process skills.

DATA and METHOD

In the study, quasi-expertimental design from quantitative research approaches was used. McMillan and Schumacher (2006) stated that quasi-experimental research design should be used in studies where the effects of more than one teaching method on various factors were examined. In this study, four application groups in which lessons based on Multiple Intelligence, Problem Based Learning, Peer Teaching and the Combined Method were taught, and a comparison group in which lessons were taught according to the teaching method proposed by the Ministry of National Education (MONE) in 2017. Also, in the study, the nonequational control group design, which is one of the quasi-experimental research model, was used.

In application groups, the lessons were taught by the researcher. The researcher constantly attended the classes in the comparison group. In addition, the researcher was followed by one observer while he was teaching his lessons. It was ensured that it was equidistant to the groups and that the activities were carried out completely. In addition, intermediate tests were applied by the teacher in the process and students were informed about their development.

Sample

The sample of this research consists of 185 seventh grade students who were studying in two secondary schools in the Yakutiye district of Erzurum. In the study carried out within a 10-week period, the application groups consisted of 153 students (MIG n = 36, PIG n = 41, PBLG n = 37 and CYG n = 39), and the comparison group consisted of 32 students.

Working Groups and Methods

In the teaching of topics and concepts related to Cell and Division and Force and Energy units;

Lessons were taught according to Multiple Intelligence Theory in MIG.

- In this group, heterogeneous groups were created by considering the intelligence types of students.

- Students with different intelligence types come together to provide opinions on the tasks they will undertake in projects.

- After the tasks were distributed among the students, the courses were divided into 10-minute sections.

- It was briefly taught subjects by the teacher according to the intelligence types of the students (presentations, instruments, drama, writing composition, group discussions etc.).

- Three weekly course hours students developed materials according to their intelligence types. Later, students presented their products to other friends in the classroom.

- Finally, the reports prepared by the students in the groups were presented to the teacher.

- These applications were repeated throughout the process.

Problem-Based Learning Method was used in teaching the subjects and concepts of related units in PBL.

- In this group, students have divided into groups of five and four people heterogeneous in terms of their success.

- Then, the students were presented with problem scenarios by the teacher.

- The students provided solutions suitable for the problems by using scientific process steps.

- The students discussed the solution suggestions for the problems with their group friends.

- Then, until the next lesson, the students conducted resource research.

- In the next lesson, the students solved the problem by making a group discussion and made a presentation to the class.

- Finally, the reports prepared by the students in the groups were presented to the teacher.

- These applications were repeated throughout the process.

In another group, PIG, the lessons were taught by considering the Peer Instruction Method.

- In this group, students were given reading assignments. The purpose of this assignment is to ensure that they are familiar with the subject.

- Lessons was divided into sections by the teacher. In the first 15 minutes, the teacher explained the concepts related to the subject.

- Then, the concept questions were asked to the students through the smart board in the lesson.

  o Initially, the students gave their individual answers to the concepts questions by thinking themselves.

  o When the correct answer rate of the question is too high, the other conceptual question is reflected on the smart board.

  o If 30-70% of the students answered correctly, they were asked to give repeat their answers after having group discussions.

  o If less than 30% of the students give the correct answer, the teacher teaches the subject again.

- These applications were repeated throughout the process.

In CYG, the Combined Method was used in the teaching of the concepts related to the units.

- Multiple Intelligence, Problem Based Learning and Peer Instruction Methods were used in combining methods.

- In the lessons taught according to this method, heterogeneous groups have been formed by taking into account the students' lesson success and intelligence types.

- In this group, the students prepared for the lessons through reading assignments before the lesson.

- In the first lesson, students read and answered the questions in problem scenarios (Applications in PBL were carried out in this group respectively).

- During the other lesson hours, concept questions were asked by the teacher and group discussions were held. These practices have continued in the next lesson (Applications in PIG) were carried out in this group respectively.

- In the last lesson of the week, students developed products based on their intelligence.

- These applications were repeated throughout the process.

In CG, Lessons were taught according to the methods in MONE (2017) curriculum.

- The teacher have started the lesson by preparing models related to subject.

- After the teacher explained the subject on the models, students were divided into groups and played a question and answer game under the guidance of the teacher.

- In the process, the concepts related to the subject were embodied through simulation.

- In the next lessons, the students came to the lesson by preparing a presentation.

- After five randomly selected students making their presentations, discussed with their friends on topics and concepts.

- These applications were repeated throughout the process.

Process

One year before the study, it was decided by randomly selected which method to apply in which class. In the previous semester, the lessons were taught according to the specified methods so that students are familiar with the methods. In this way, it have been ensured that each working group is familiar with the methods. In the next semester, a pilot study was started three weeks before the main study with a different group of students than the groups where the main study would be applied. The possibility that the MoNE could change the curriculum made it necessary to conduct the pilot study in the specified period. Conducting the pilot study shortly before the main study have helped the researcher to identify and solve the problems immediately that may be encountered. In this process, the reliability and validity levels of the scales and materials to be used in the main study were determined. In addition, in the main study, the problem scenarios to be presented to the students and the sections that were not understood on the concept questions were determined and the necessary corrections were made in a short time. Pretests were applied to student groups one week before the main study. In the main study, the practices continued during the nine weeks. In the tenth week, the study was ended by applying posttests to the students.

Data Collection Tools

Student Engagement Scale

The scale, developed by Reeve and Tseng (2011) in order to determine the level of student engagement, was adapted to Turkish through the study of Hıdıroğlu (2014). The Student Engagement Scale (SES), consisting of 22 items in a 4-point Likert structure, measures four sub-dimensions. In scale; emotional engagement with four items, cognitive engagement with eight items, behavioral engagement with five items and agentic engagement with five items was measured. The cronbach alpha coefficient of the adapted scale was reported by the researchers as .82. In this study, it was calculated as .84 for behavioral engagement dimension, .86 for cognitive engagement dimension, .82 for emotional engagement dimension, .85 for agentic engagement dimension, and internal consistency coefficient for the entire scale was .93. In addition, it was found that the scale scores of the students in the upper and lower 27% slice were statistically significant (p <.05). These findings are an indication that the scale is reliable and valid.

Scientific Process Skills Scale

The Scientific Process Skills Scale (SPSS), developed by Aydoğdu, Tatar, Yıldız and Buldur (2012), consists of a total of 27 multiple choice items prepared to measure basic and high level skills. While the number of items that measure the basic skills dimension (observation, classification, measurement, recording data, establishing number and space relationship, estimating, inferring, communicating and using numbers) is nine, the number of items that measure upper level skills (hypothesis, interpreting data, experimenting, modeling, functional definition and controlling variables) is eighteen. The cronbach alpha coefficient of the scale was reported by the researchers as

.84. In this study, it was determined that the reliability coefficient was .81 and the test scores of the students in the upper and lower 27% slices were statistically significant (p <.05). These findings are an indication that the scale is reliable and valid.

FINDINGS

Normality tests were applied to determine whether the data had a normal distribution before inferential statistics were made in the study. In order to decide the data whether the data have normally distribution or not, skewness and kurtosis values should between +/- 2 values, the sig value in the test of normality table greater than .05 (In large samples p value may be lower than .05), the data in the histogram graph should be close to the normal distribution, and finally the values in the detrended normality curve should not form meaningful shapes on the zero line (Palant, 2016). In this study, it was determined that the data obtained from Scientific Process Skills Scale (SPSS) had a normal distribution, but the data obtained from the Student Engagement Scale (SES) was not distributed normally. For this reason, while in the inferential statistics section, parametric tests were used in the analysis of data related to SPSS, while non-parametric tests were used in the analysis of data related to SES.

Findings Related to the Equivalence of Groups

Pre-Application

Before starting the study, preliminary tests related to student engagement and scientific process skills were carried out to determine whether the scientific process skill and student engagement levels of different groups were statistically different from each other. Since there are five different groups in the study, one-way analysis of variance was performed to determine whether the students in the groups were equivalent in terms of scientific process skills before the study. Findings from variance analysis are presented in Table 1.

Table 1 One Way ANOVA Analysis Regarding the Total Scores of the Groups Before Application.

Variable	Source of variance	Sum of Squares	df	Mean square	F	p
Scientific Process Skills	Between groups	186.66	4	46.66	2.3	.55
	Within groups	3562.56	180	19.79		

When the values in Table 1 are examined, it is seen that the scientific process skill levels of the students in the groups where the lessons will be taught according to different teaching methods are similar to each other before starting the application (p> .05).

Kruskal-Wallis H test was performed to determine whether the groups differed in terms of student engagement before the application (See, Table 2).

Table 2 Kruskal-Wallis H Table Regarding the Total Student Engagement Scores of the Groups Before Implementation

	Groups	f	Mean Rank	Sd	Chi-Square	p
	MIG	36	94,14			
	PBLG	37	93,43			
Student Engagement	PIG	41	99,28	4	2.67	0.61
	CYG	39	81,29			
	CG	32	97,44			
	Total	185				

When the values obtained from the Kruskal-Wallis test are analyzed, it can be said that the engagement of students in the classes was similar to each other before the application (p> .05).

Inferential Statistics

After the application, dependent groups t test was performed to determine how the groups changed in terms of scientific process skills (see, Table 3).

Table 3 Pretest-Posttest Results in Terms of Scientific Process Skills of Students in Different Groups

	Groups	Pre-test	Post-test	Mean Difference	SD	SE	t	p
Pre- SPS- Post-SPS	MIG	9.94	11.17	-1.22	5.04	0.84	-1.45	.15
	PBLG	11.59	16.38	-4.78	4.87	0.80	-5.97	.00
	PIG	11.54	12.56	-1.02	3.41	0.53	-1.92	.06
	CYG	9.90	15.75	-5.78	4.88	0.81	-7.11	.00
	CG	12.53	11.78	0.75	4.42	0.78	0.96	.34

When Table 3 is analyzed, it is seen that there is an increase in the scientific process skills total scores of the students in the other groups except the students in the comparison group. However, among these increases, only the increase in the scores of PBLG and CYG students is statistically significant. These findings show that the lessons taught according to the Problem Based Learning Method and the Combined Method contribute to students' scientific process skills.

According to different groups to determine how students' engagement levels changed was conducted The Wilcoxon test. The values calculated as a result of the analyzes are presented in Table 4.

Table 4 Wilcoxon Test in which Groups are Examined in Terms of Student Engagement Total Score

Groups	Post test- Pre test	N	Mean Ranks	Sum of Ranks	Z	p
MIG	Negative rank	15	19.53	293.00	-0.36	.72
	Pozitive rank	20	16.74	337.00		
	Equal rank	1				
PBLG	Negative rank	18	18.19	327.50	-0.86	.93
	Pozitive rank	18	18.81	338.50		
	Equal rank	1				
PIG	Negative rank	13	17.92	233.00	-2.56	.01
	Pozitive rank	28	22.43	628.00		
	Equal rank	0				
CYG	Negative rank	5	15.90	79.50	-4.33	.00
	Pozitive rank	34	20.60	700.50		
	Equal rank	0				
CG	Negative rank	19	17.89	340.00	-1.42	.15
	Pozitive rank	13	14.46	188.00		
	Equal rank	0				

When the values in Table 4 are analyzed, it is seen that only the students in the PIG and CYG among the students studying in different groups made a statistically significant difference. The level of student engagement in other groups has not changed. This is an indication that Peer Instruction and the Combined Method are more beneficial for student engagement.

In terms of SES total scores, Kruskal Wallis H test was performed to determine whether posttest scores differ among groups. The data obtained from the analysis are presented in Table 5.

Table 5 Comparing SES Scores of Students in Different Groups: Kruskal Wallis H Test Results

	Groups	f	Mean Rank	Sd	Chi-Square	p
Student Engagement	MIG	36	79.28			
	PBLG	37	80.32			
	PIG	41	109.04			
	CYG	39	128.06	4	37.17	.00
	CG	32	59.81			
	Total	185				

When Table 5 is analyzed, it is seen that there is a significant difference between the groups in terms of students' engagement levels. In order to determine between which groups this difference is, post hoc of k samples test was done (see, Table 6).

Table 6 Comparison of Classroom Engagement Posttest Scores of Students in Different Groups

Groups	Groups	Test statistics	S.E	p
MIG	PBLG	-1.05	12.53	.93
	PIG	-29.76*	12.22	.01
	CYG	-48.79*	12.37	,00
	CG	-19.46	13.00	.13
PBLG	MIG	1.05	13.00	.13
	PIG	-28.71*	12.14	.02
	CYG	-47.74*	12.28	.00
	CG	-20.51	12.92	.11
PIG	MIG	29.76*	12.22	.01
	PBLG	28.71*	12.14	.02
	CYG	-19.03	11.97	.11
	CG	49.22*	12.62	.00
CYG	MIG	48.79*	12.37	,00
	PBLG	47.74*	12.28	.00
	PIG	19.03	11.97	.11
	CG	68.25*	12.77	,00
CG	MIG	19.46	13.00	.13
	PBLG	20.51	12.92	.11
	PIG	-49.22*	12.62	.00
	CYG	-68.25*	12.77	,00

*p < . 05

When Table 6 is analyzed, it is seen that there is a significant difference in favor of PIG and CYG in terms of students' engagement levels. These values show that teaching subjects and concepts according to the Peer Instruction Method has a positive effect on students' engagement. So the level of engagement of students, who had discussions on concept questions with peer groups and who had to answer the questions posed to them, was positively affected. On the other hand, the use of the activities used in the Peer Teaching Method in the Combined Method also making a positive effect on the level of engagement of CYG students.

In groups where lessons are taught according to different teaching methods, one-way ANOVA test was performed over the total scores of SPSS post-test in order to determine how students' scientific process skills changed. Values obtained from ANOVA test are as in Table 7.

Table 7 Comparison of Posttest Scientific Process Skills of Students in Different Groups: One Way Anova Test Results.

Variable	Source of variance	Sum of Squares	df	Mean square	F	p
Scientific Process Skills	Between groups	814.93	4	203.73	8.72	.00
	Within groups	4134.02	177	23.36		

*$p < .05$

When the values in Table 7 are analyzed, it can be seen that the post-test SPSS total scores of students in different groups differ statistically. The Bonferroni test, which is preferred in the equality of variances, was used to determine which groups this difference is between. Values obtained from Bonferroni test are as in Table 8.

Tablo 8 Comparison of Students in Different Groups in Terms of Scientific Process Skills Post-Test Scores.

Groups	Groups	Mean Difference	S.E	p
MIG	PBLG	-5.21*	1.13	.00
	PIG	-1.39	1.10	.99
	CYG	-4.58*	1.14	.00
	CG	.61	1.17	.99
PBLG	MIG	5.21*	1.13	.00
	PIG	3.82*	1.10	.01
	CYG	.63	1.13	.99
	CG	4.60*	1.17	.00
PIG	MIG	1.39	1.10	.99
	PBLG	-3.82*	1.10	.01
	CYG	-3.19*	1.10	.04
	CG	.78	1.14	.99
CYG	MIG	4.58*	1.14	.00
	PBLG	-.63	1.13	.99
	PIG	3.19*	1.10	.04
	CG	3.97*	1.17	.01
CG	MIG	.61	1.17	.99
	PBLG	-4.60*	1.17	.00
	PIG	-.78	1.14	.99
	CYG	-3.97*	1.17	.01

*$p < .05$

When the values obtained from the Bonferroni test are analyzed, it is seen that the groups that the lessons are taught according to the Problem Based Learning and the Combined Method are more successful than the other groups ($p <.05$). These values are an indication that the processing of lessons according to Problem Based Learning and the Combined Method contributes to students' scientific process skills.

DISCUSSION AND CONCLUSION

In today's work environments, it is not enough for an engineer, teacher or doctor to know only his own field. These people need the support of their colleagues, students and other professional groups. This situation requires individuals to have a high level of social and academic skills. Given that robots will do ordinary jobs in a world where computer and information technologies are constantly developing, people need to be more qualified and have high-level skills. For this reason, individuals are expected to participate actively in the academic process and to be able to produce suitable solutions to the problems they may encounter.

On the other hand, in order to create the desired human profile, modern methods should be used in the education-training process. When the effects of the methods on the specified variables are discussed, respectively; Peer Instruction Method is a method in which students interact constantly with each other, increasing their level of interest and engagement in the lesson (Fagen, Crouch & Mazur, 2002; James, 2006). In the method, students' do their reading homework, discussion of the concept questions individually and in a group affects students' engagement in the lesson positively (Crouch & Mazur, 2001; Mazur, 1997). In this study, it was determined that students' engagement levels differ in terms of the methods used (see, Table 2,4,5). Especially in groups where the lessons are taught according to the Combined Method and Peer Instruction Method, the meaningful increase in students' engagement levels supports many studies in the literatüre (Green, 2003; James, 2006; Mazur, 1997; Nicole & Boyle, 2003; Sumangala & Stephen, 2000). The fact that the other groups lag behind CYG and PIG in terms of the engagement variable shows the importance of the activities in the Peer Instruction Method. The main reason for the successful of the Peer Teaching and the Combined Method in terms of the engagement variable is the assignment of reading assignments, the use of conceptual questions and student discussions. This result supports the studies in the related literature. Because the studies in the literature emphasize that teaching practices in Peer Instruction Method has a positive effect on students' behavioral, emotional and cognitive engagement (Akkurt, 2010; Fagen, Crouch & Mazur, 2002; Kalem & Fer, 2003).

It is another result of this study that problem based learning applications have a positive effect on scientific process skills. In this teaching method, the students' generating ideas about the solution of the problems by using the scientific process steps contribute to the development of students' scientific process skills (Açıkyıldız, 2004; Tavukcu, 2006). In this study, the positive effect of Problem Based Learning and Combined Method on scientific process skills was determined (see, Table 1,3,7,8). While Problem Based Learning and Combined Method groups were similar in terms of scientific process skills, students in other groups lagged behind PBLG and CG in terms of this variable. This situation proves the positive effect of Problem Based Learning and Combined Method on students' scientific process skills. Students' searching for solutions to problem situations by using scientific process steps have improves their scientific process skills. The use of problem-based learning activities in the group where lessons are taught according to the Combined Method has led to the improve of scientific process skills of students studying at CYG. Similar to this study, many studies stating that Problem Based Learning activities have a positive effect on students' scientific process skills are available in the literatüre (Aydoğdu, 2012; Bayrak, 2007; Gürses, Açıkyıldız, Doğar & Sözbilir, 2007; Karaöz, 2008; Keil, Haney & Zoffel, 2009; Tatar & Oktay, 2011; Tavukçu, 2006).

As a result, rational combining of different teaching methods such as Multiple Intelligence, Peer Instruction, Problem Based Learning completes the shortcomings of each method. Thus, in the combined method, the strengths of each method are used. The findings of this study support the stated statements.

Investigating only the effect of methods on student engagement and scientific process skills is the weakness of this study. Because in this study, no special efforts were made to provide students with lesson engagement and scientific process skills. If it is desired to contribute to the teaching of lesson engagement and scientific process skills at a high level, additional activities can be given both inside and outside the classroom at CYG. Thus, success in teaching these two variables can be maximized.

Suggestions

- In line with this study, some suggestions were made for the future studies. These;

- Combined methods should be preferred in order to benefit from the positive outcomes of more than one method instead of the lessons being taught by adhering to one method.

- While combining the methods, the structure of the course and the subject should be taken into consideration.

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