The Effects of Out-of-School Learning Settings Science Activities on 5th Graders' Academic Achievement *

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Abstract: The purpose of this study was to investigate the effect of lessons conducted in out-of-school learning settings on 5th graders science achievement within the scope of a guidance material that was prepared to be used in out-of-school learning settings in accordance with the "Let's Solve the Riddle of Our Body" chapter objectives. The pretest / posttest equalized control group design, which is one of the quasi-experimental designs, was used in this study. The sample of this study was composed of a total of 31 5th grade students (15 were in experimental group, 16 were in control group) that were selected from secondary schools in the first semester of the 2015-2016 academic year in Tokat Province. Let's Solve the Riddle of Our Body Chapter Achievement Test (LeSROBAT) was administered before and after the implementation of the guidance material to measure the students' achievements and retention. The lessons were conducted as suggested by the current curriculum in the control group. The data were analyzed using independent samples t-test and covariance analysis (ANCOVA). As a result of the analyses, it was found that the LeSROBAT post-test scores of experimental group were significantly higher than the control group. Within this context, it was concluded that the out-of-school learning settings positively contributed to academic achievement and the guidance material that was developed within the scope of this study was effective. The results of retention test analyses didn't reveal any significant difference between the posttest and retention test scores of experimental and control groups. When the LeSROBAT retention test scores were examined, it was observed that the scores of experimental group was higher than the control group.

Keywords: *Out-of-school learning settings, science course, academic achievement, let's solve the riddle of our body chapter.*

Introduction

Human being has needed to learn since its existence. The increasing population has introduced the concept of 'school', which aims to inform people formally. The Turkish Language Association (1994: 558) defines the school as 'the place where the collective education and instruction is offered in a variety of levels starting from literacy. The information provided in schools is organized in a specific plan and program, and limited by the school walls. Vygotsky developed a sociocultural viewpoint about learning based on his theoretical study on child development. According to him, learning and development is transmitted from a social context to individual understanding; in other words, the knowledge is a phenomenon that is firstly met in the interactions with people then associated with students (Kozulin, 2003; Wertsch, 1991 as cited in Zhai, 2015). With reference to this notion, it can be inferred that the individual should be in an interaction with the social environment for learning and development. Out-of-school learning settings are considered to be the best environments where the individual can interact with the social environment.

Out-of-school learning settings are defined as the trips and activities that are conducted beyond the school walls in a planned and programmed way in direction with specific purposes (LacinSimsek, 2011). Out-of-school learning settings involve museums, planetariums, nature camps, aquariums, factories, etc. as well as communication devices such as internet, phones, etc. (Hofstein and Rosenfeld 1996). Although the out-of-school learning setting reminds the unplanned (informal) education, it involves the education that is composed of planned (formal) activities. Formal education is an education system that is extremely institutionalized and hierarchically structured stages from pre-school education to postgraduate education (Jeffs and Smith, 1990). According to Ramey - Gassert (1997), learning in

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school is free from the real life, has little association with real events and objects, and has little contribution to students' socialization. On the other hand, out-of-school learning increases desire to learn, motivation and attitude, and contributes to students' socialization (Ramey-Gassert, Walberg and Walberg, 1994).Out-of-school learning settings have positive effects on students cognitively and affectively since they are the environments where the students freely question and reach the knowledge on their own (Turkmen, 2010). Within this context, the National Research Council (1996) argues that the science of school should go beyond the school walls and involve the social resources. A body of research showed that the students that participated in out-of-school learning activities and reinforced by in-school activities were successful cognitively and affectively when the out-of-school activities were planned well (Anderson, Kisiel, and Storksdieck, 2006; Orion and Hofstein, 1991).Within this context, the effect of lessons carried out in out-of-school settings within the framework of a guidance material which was prepared in accordance with the objectives of 5th grade 'Let's Solve the Riddle of Our Body' chapter of 2013 Science Curriculum on 5th graders' academic achievement in science courses was examined. In this direction, the research questions below were tried to be answered;

On the 'Let's Solve the Riddle of Our Body' chapter in out-of-school learning settings;

- Is there a statistically significant difference between the experimental and control groups' scores obtained from the academic achievement pretest?
- Is there a statistically significant difference between the experimental and control groups' scores obtained from the academic achievement posttest?
- Is there a statistically significant difference between the experimental and control groups' scores obtained from the retention test?
- How are the achievement levels of experimental and control groups in pretest, posttest, and retention test about the 'Let's Solve the Riddle of Our Body' Chapter?

Methodology

The pretest / posttest equalized control group design, which is one of the quasi-experimental designs, was used in this study. In the pretest / posttest equalized control group design, which group will be the experimental or control is chosen through nonrandom assignment. So the group to be studied is decided beforehand. Both groups are administered a pretest. The experimental group is intervened while there is no intervention for the control group, and both groups are administered a post test (Buyukozturk, KilicCakmak, Akgun, Karadeniz, and Demirel, 2014). In educational research, quasi-experimental designs are frequently used since it is not possible to make random assignments to experimental and control groups most of the time (Metinel al., 2015). Accordingly, pretest and posttest were administered to both experimental and control group in this study. The experimental design can be viewed in Table 1.

Table 1. Experimental design of the research

	Pretest	Intervention	Posttest
Experimental Group	Achievement Test (LeSROBAT),	Instruction based on current curriculum aided by guidance material	Achievement Test (LeSROBAT)
Control Group	Achievement Test (LeSROBAT),	Instruction based on current curriculum	Achievement Test (LeSROBAT)

The Sample Group

A total of 31 5th graders who were studying at secondary schools affiliated to Ministry of National Education (MONE) participated in this research. The schools that were involved in the research were chosen based on the similarities in the schools' physical capacities, the science teachers' characteristics such as gender, education level, experience, classroom size, and students' socio-cultural characteristics. The experimental and control groups were chosen through convenience method. This method is preferred since it prevents the loss of time, money, and labor (Buyukozturk et al., 2014). Of all the participants, 15 (10 male, 5 female) were in the experimental group, while 16 (7 female, 9 male) were in the control group.

Data Collection Tools

A material that would guide the out-of-school activities was prepared beforehand. This material involved the 'Let's Solve the Riddle of Our Body' chapter of the science curriculum, which was started to be implemented in 2013-2014 academic year. This chapter was chosen because all of the objectives in this chapter were suitable for out-of-school learning settings. Let's Solve the Riddle of Our Body Achievement Test (LeSROBAT) was developed and administered before and after the implementation of guidance material in order to determine the students' academic achievement and retention. This test was composed of items covering the aforementioned chapter's objectives.

LeSROBAT is a test composed of 30 multiple-choice items. During the development process of the test, a list involving 13 objectives were created. These objectives already took place in curriculum. Then, 7 more objectives were added to the list since they were appropriate to this research's purpose. These lists were revised twice based on a science

education expert. These 20 objectives were planned to be measured using 36 items. Afterwards, test items were meticulously generated, and a table of specifications was created. Table of specificationsprovide an evidence for the content validity at the same time. The cognitive section of Bloom's taxonomy was used during the preparation of the table of specifications. Then, the items were revised by a science teacher one more time considering the table of specifications for the final time. The test was reviewed by an academic on science education and two science teachers who had at least 5 years of teaching experience in terms of content and the template. Moreover, 2 experts on Turkish language also reviewed the test in terms of linguistic and spelling rules. Some modifications were made based on the feedbacks. The developed LeSROBAT was administrated to 6 students as a pilot study. During the pilot study, it was observed that a course hour (40 mins) was enough for students to complete the test. Whether the students comprehend the words, sentences, figures, etc. in the test was examined and their opinion regarding the difficulty was taken.

After this process, LeSROBAT was administered to 76 students from 5 different schools who completed the 'Let's Solve the Riddle of Our Body' chapter. Item discrimination index and difficulty index for each item was calculated. As a result of this analysis, some of the items were excluded from the test, while some of them were revised. The findings regarding the LeSROBAT analysis are presented in Table 2.

Table 2. Findings regarding LeSROBAT analysis

N	$\bar{X}$	Sd	Median	Mod	Variance	Mean Difficulty	KR-21
76	19.72	5.99	21	26	35.88	.64	.839

When the Table 2 was examined, it can be seen that the median and the mean scores were close. However, the mod was bigger than median and the mean. Thus, it can be stated that the distribution was left skewed. The mean difficulty, standard deviation, and KR-21 reliability were calculated as .64, 5.99 and .839, respectively. These findings showed that the developed test could be used.

The first version of the test was composed of 36 items. All of them were multiple-choice questions. Although some items were involved in the objectives, they were excluded from the test due to low item discrimination index. Some items were revised based on expert opinions. Considering the representation of each objective byat least one item, the final version of the test was composed of 30 items.

Procedure

At the beginning of 2015-2016 academic year, LeSROBAT was administered to experimental and control groups as the pretest. Then the experimental group was implemented the out-of-school activities while the control group continued the regular instruction provided in the curriculum. The out-of-school activities are presented in the flowchart in Figure 1.
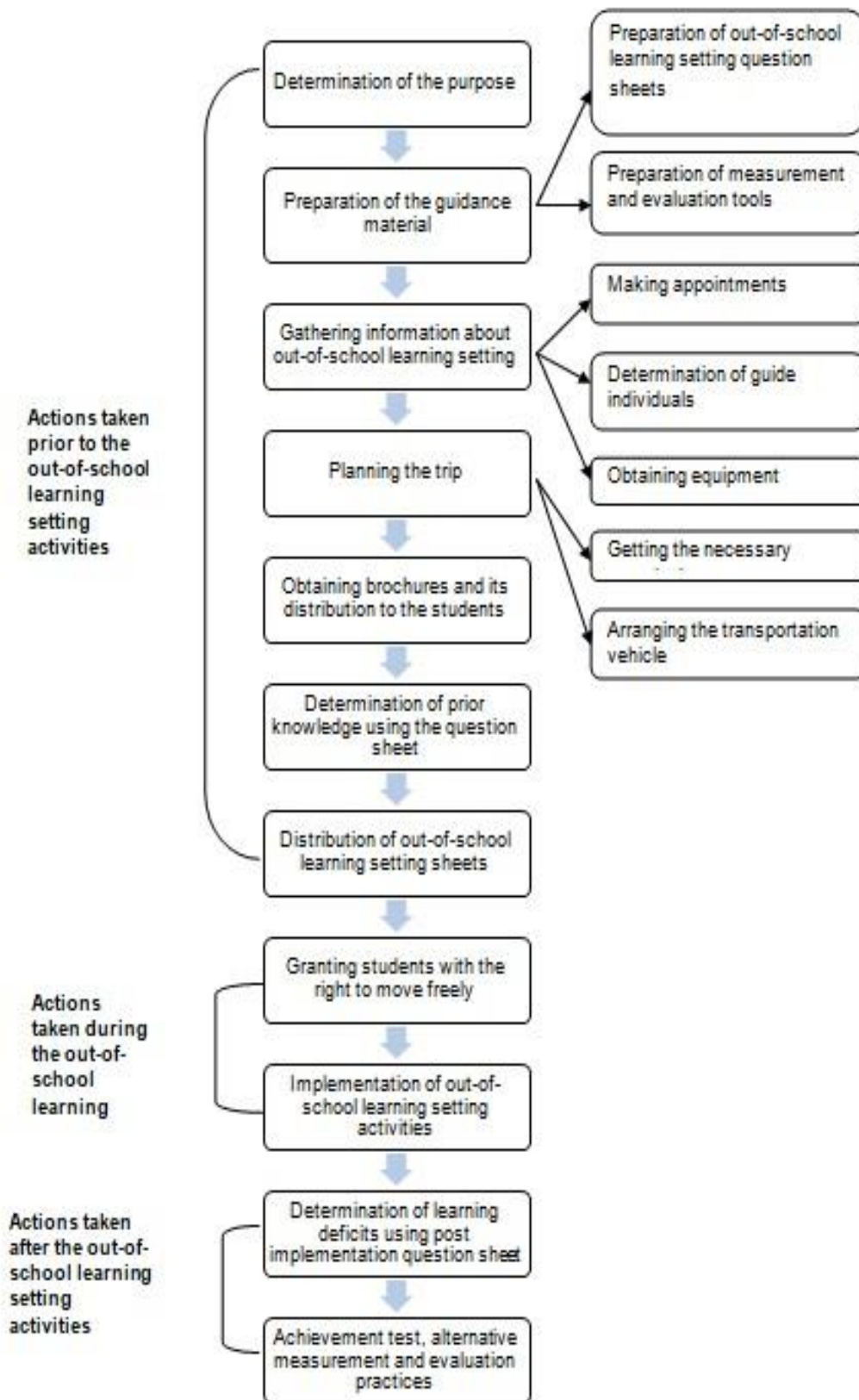
Figure 1.Out-of-school learning setting flowchart

LeSROBAT was administered to experimental and control group as the posttest after the end of the 'Let's Solve the Riddle of Our Body' chapter. LeSROBAT was administered to experimental and control group 9 months after the posttest as the retention test.

Data Analysis

Upon the collection of the data, skewness and kurtosis values were examined to check the normality of the data obtained from control and experimental group. A skewness value between -1.96 and +1.96 with a sample smaller than 50 participants is an indicator of normal distribution (Kim, 2013). The skewness values calculated in this research were observed to be within this range. Moreover, Kolmogrov - Smirnov test was also used to check the normality. p>.05 for all tests were found through this analysis. Accordingly, the data were observed to distribute normally. The data obtained the pretest using LeSROBAT were analyzed using independent samples t-test. Independent samples t-test is used to determine whether the differences between the means of two distinct samples are significant or to compare two independent groups on a continuous outcome (Secer, 2013). The data obtained from the posttest using LeSROBAT were analyzed using one-way covariance analysis (ANCOVA). ANCOVA is an analysis technique that reveals whether there is a significant difference between the mean scores of two or more independent groups based on a common variable (Secer, 2013). ANCOVA was used especially to control the pretest scores. The data analysis process was completed making use of the aforementioned analyses.

Findings

The academic achievement test was administered as the pretest to control and experimental groups to determine the students' levels before the intervention. The findings of independent samples t-test of the pretest results are presented in Table 3.

Table 3.t-test findings of let's solve the riddle of our body chapter achievement test administered as the pretest to control and experimental groups

	N	$\overline{X}$	Sd	Df	t	p
Experimental Group	15	12.47	4.14	29	.897	.946
Control Group	16	13.81	4.21			

*p<.05

As can be seen in Table 3, it was determined that there wasn't a significant difference between the scores of experimental and control groups (t (.05:29) =.897). The groups were compared using one-way covariance analysis (ANCOVA) in order to test the effect of intervention by assuming the pretest as the dependent variable.

The findings of ANCOVA of the posttest results regarding the experimental and control groups are presented in Table 4.

Table 4. Descriptive statistics of let's solve the riddle of our body chapter achievement test posttest results in terms of groups

	N	Mean	Corrected Mean
Experimental Group	15	24.53	25.04
Control Group	16	19.00	18.53

As can be seen in Table 4, the mean scores of experimental and control groups were calculated as 24.53 and 19.00, respectively. However, when the pretest scores were controlled as the common variable, some changes on the posttest scores were observed. The corrected mean scores of experimental and control groups were 25.04 and 18.53, respectively. The results of ANCOVA conducted to determine whether the difference between the groups' posttest scores was significant or not are presented in Table 5.
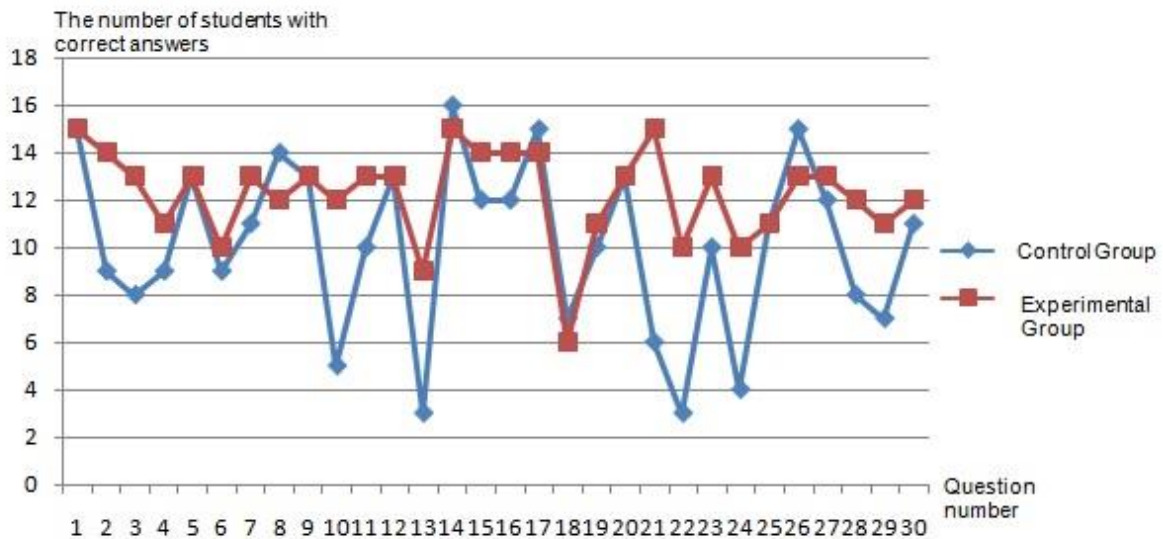
Table 5. The results of ANCOVA of let's solve the riddle of our body chapter achievement test posttest in terms of groups

Source	Sum of Squares	Df	Mean Square	F	p
Achievement (pre)	263.59	1	263.59	19.01	.000*
Group	318.72	1	318.72	22.99	.000*
Error	388.15	28			
Total	15456.00	30			

*p<.05

According to the findings in Table 5, a significant difference between the groups was determined when the experimental and control groups were compared [F(1-28)= 22.99 p<.05].

The correct answers of experimental and control groups' on posttest were compared. The results can be viewed in Graph 1.

Graph 1. The number of correct answers given by the experimental and control group in the posttest

The posttest was administered to 15 and 16 students from experimental and control group, respectively. When the Graph 1 is examined, it can be seen that the experimental group gave more or equal number of correct answers to all questions except for the questions 8 and 26 compared to control group. Both the 8th and the 26th questions were from the "food and its properties" part. The 8th question was about the fresh and natural food, while the 26th question was about the harms of smoking on environment. The biggest difference between the experimental and control group was among the answers given to the 10th, 13th, 21st, 22nd, and 24th questions. The 10th question was from the "food and its properties" part was about fresh food. The 13th question was from the "digestion of food" and was about showing the place of organs that have a role in digestion on the model. The 21st and 22nd questions were from the "urinary in our body" part and were about accessory digestive organs. The 24th question was from the "food and its properties" part and was about diseases caused by the lack of vitamin.

Nine months after the posttest, a retention test was administered to experimental and control group students. Independent samples t-test was performed to compare the groups' scores. The results can be seen in Table 6.

Table 6. t-test results of posttest – retention test mean scores of experimental and control group students

		N	X̄	Sd	df	t	p
Experimental Group	Posttest	14	25.29	4.23	13	1.63	.127
	Retention Test	14	24.36	3.37			
Control Group	Posttest	16	19.00	4.47	15	.99	.337
	Retention Test	16	18.25	5.40			

*p<.05

When the Table 6 is examined, it can be seen that one student from the experimental group didn't take the test, which means a 5% decrease in the experimental group. The analysis showed no significant difference between the experimental group's posttest and retention test scores at the p<.05 level. Similarly, no significant difference was observed between control group's posttest and retention test scores at the p<.05 level.

Independent samples t-test was conducted to determine whether there was a significant difference between the retention test scores of experimental and control groups. The results can be seen in Table 7.
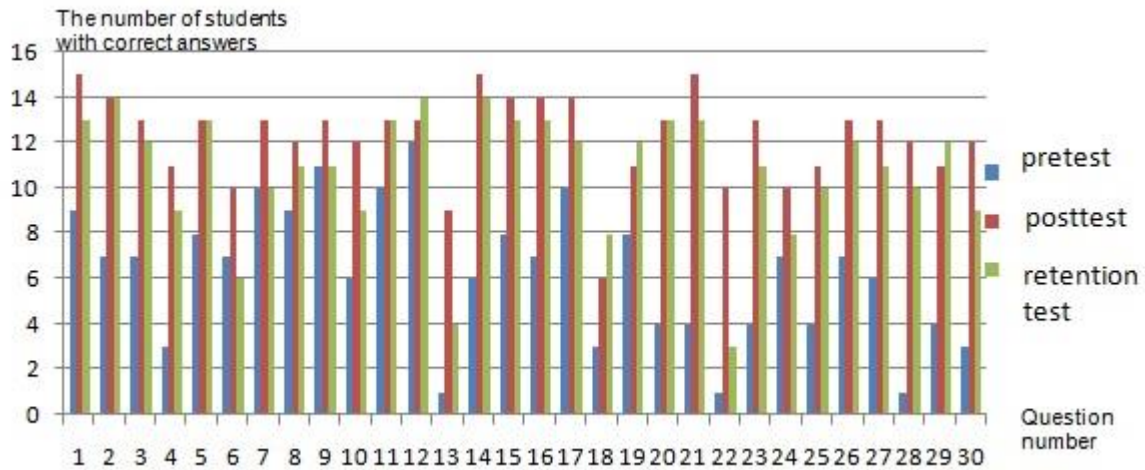
Table 7. t-test findings of let's solve the riddle of our body chapter achievement test administered as the retention test to control and experimental groups

	N	X̄	Sd	df	t	p
Experimental Group	14	24.36	3.37	28	3.65	.001*
Control Group	16	18.25	5.40			

*p<.05

As can be seen in Table 7, the retention test scores of experimental group students were significantly higher than the scores of control group students (t(.05:28)= 3.65).

The correct answers of experimental group's on pretest, posttest, and retention test were compared. The results can be viewed in Graph 2 and 3.

Graph 2. The number of experimental group students with correct answers to the questions in LeSROBAT pretest, posttest, and retention test
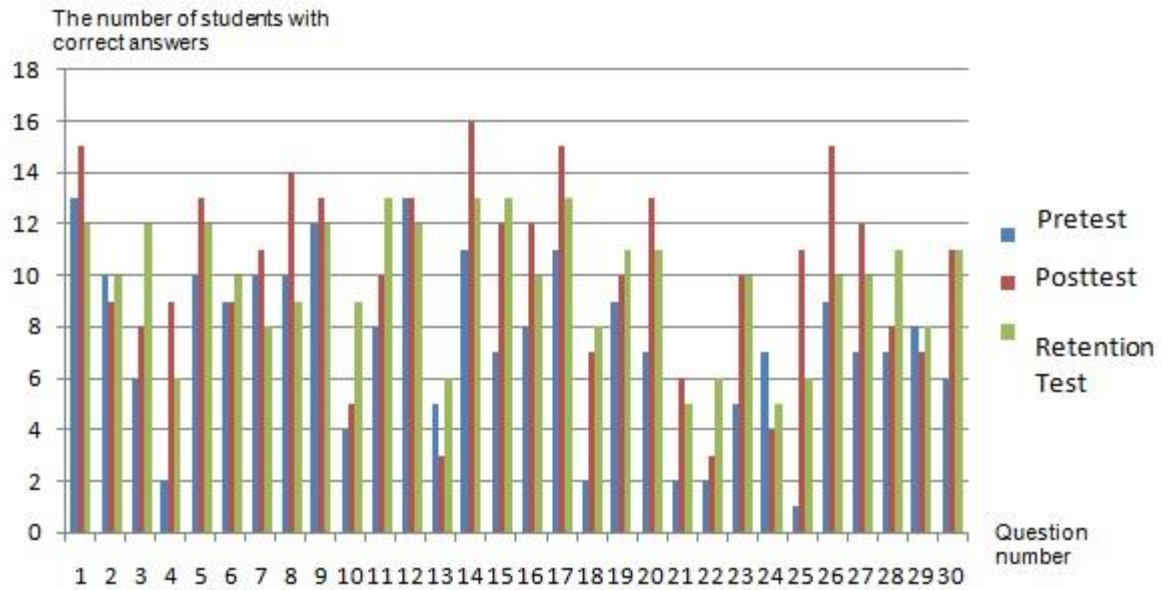
When the Graph 2 is examined, it can be seen that the most correct answers were given to 9th and 12th questions in the pretest by the experimental group students. Both the 9th and 12th questions were from the "food and its properties" part. The 9th question was about fresh and clean food, while the 12th question was about the harms of smoking and alcohol. The questions 13, 22, and 28 were those which had the least correct answers. The 13th question was from the "digestion of food" part and was about recognition of organs that had a role in digestion. The 22nd and 28th questions were from the "urinary in our body" part. The 22nd question was about the existence of different urinary ways in the body, while the 28th question was about the health of urinary system.

In the posttest, the most correct answers were given to 1st, 14th, and 21st questions by the experimental group students. The 1st question was from the "food and its properties" part and was about the necessity of nutrition for all creatures. The 14th question was from the "digestion of food" part and was about tooth types. The 21st question was from "urinary in our body" part and was about the existence of different urinary ways in the body. The questions 13 and 18 were those which had the least correct answers. Both of them were from the "digestion of food" part. The 13th question was about recognition of organs that had a role in digestion, while the 18th question was about the transmission of nutrients after digestion through blood.

A total of 14 participants took part in the retention test. The most correct answers were given to 2nd, 12th, and 14th questions by the experimental group students. The 2nd and 12th questions were from the "food and its properties" part. The 2nd question was about the food containing different types of vitamins, while the 12th question was about the harms of smoking and alcohol. The 14th question was from the "digestion of food" part and was about gingival. The questions 13 and 18 were those which had the least correct answers. Both of them were from the "digestion of food" part. The 13th question was about recognition of organs that had a role in digestion, while the 18th question was about the transmission of nutrients after digestion through blood.

It was observed that the questions 12, 18, 19, and 29 had more correct answers in the posttest than the retention test by the experimental group students. 12th question was from the "food and its properties" part and was about the harms of smoking and alcohol. The 18th and 19th questions were from the "digestion of food" part. The 18th question was about the transmission of nutrients after digestion through blood, while the 19th question was about the transmission of nutrients through blood. The 29th question was from the "food and its properties" part and was about the importance of a balanced and regular diet in human health. Additionally, 15 participants took the posttest while 14 students took the retention test. In this direction, it is considered that the questions 2, 3, 5, 11, 15, 16, 20, and 25 would have had more or at least equal number of correct answers in the posttest if that student had taken the retention test because there was only one correct answer difference between the posttest and the retention test.

The correct answers of control group's on pretest, posttest, and retention can be seen in Graph 3.

Graph 3. The number of control group students with correct answers to the questions in LeSROBAT pretest, posttest, and retention test

When the Graph 3 is examined, it can be seen that the most correct answers were given to 1stand 12th questions in the pretest by the control group students. Both the 1stand 12th questions were from the "food and its properties" part. The 1st question was about the necessity of nutrition for all creatures, while the 12th question was about the harms of smoking and alcohol. The questions 4, 18, 21, 22, and 25 were those which had the least correct answers. The 4thquestion was from the "food and its properties" part and was about the water and minerals that were in every nutrient. The 18th question was from the "digestion of food" and was about the transmission of nutrients after digestion through blood. The 21st and 22nd questions were from the "urinary in our body" part and were about the existence of different urinary ways in the body. The 25th question was from the "digestion of food" and was about the concept of digestion.

In the posttest, the most correct answers were given to 1st, 14th, 17th, and 26th questions by the control group students. The 1st question was from the "food and its properties" part and was about the necessity of nutrition for all creatures. The 14th and 17th questions were from the "digestion of food" part. The 14th question was about placing tooth types on the model. The 17th question was about tooth health and cleaning. The 26th question was from "food and its properties" part and was about the harms of smoking and alcohol. The questions 13 and 22 were those which had the least correct answers. The 13th question was from the "digestion of food" part and was about recognition of organs that had a role in digestion. The 22nd question was from the "urinary in our body" part and was about the existence of different urinary ways in the body.

The most correct answers were given to 11th, 14th, 15th and 17th questions by the control group students. The 11th question was from the "food and its properties" part and was about the harms of smoking and alcohol. The 14th, 15th, and 16th questions were from the "digestion of food" part. The 14th question was about placing tooth types on the model. The 15th question was about different tooth types. The 17th question was about the tooth health. The questions 21 and 24 were those which had the least correct answers. The 21st question was from "urinary in our body" and was about the existence of different urinary ways in the body. The 24th question was from the "food and its properties" part and was about the diseases that could be caused by vitamin deficiency.

When the number of control group students who gave correct answers to 2nd, 13th, 24th, and 29th questions were examined, it was observed that the number of correct answers were smaller in the pretest when compared with the posttest. The 2nd and 24th questions were from the "food and its properties" part and were about the vitamin types in different foods. The 13th question was from the "digestion of food" part and was about recognition of organs that had a role in digestion. The 29th question was from the "food and its properties" part and was about the balanced and regular diet.

It was determined that the number of students who gave correct answers to 3rd, 6th, 10th, 11th, 15th, 18th, 19th, 22nd, and 28th was higher in the retention test when compared with the posttest. The 3rd, 6th, 10th, 11th, and 12th questions were from the "food and its properties" part. The 3rd question was about the vitamin types in different foods. The 6th question was about the balanced and regular diet. The 10th question was about the fresh food. The 11th and 12th questions were about the harms of smoking and alcohol. The 15th, 18th, and 19th questions were from the "digestion of food" part. The 15th question was about tooth types. The 18th question was about the digestion organs. The 19th question was about the

transmission of nutrients through blood. The 22nd and 28th questions were from the "urinary in our body" part. The 22nd question was about the existence of different urinary ways in the body. The 28th question was about the health of the urinary system.

Discussion

Today, out-of-school education is seen as a complementary to the formal education (Bozdogan and Kavci, 2016). These environments increase students' academic achievement in addition to affective, psychomotor, and social skills (DeWitt and Storksdieck, 2008; Tal and Morag, 2009; Tatar and Bagriyanik, 2012). Within this context, the teachers should plan the out-of-school activities well so that they could be efficient (LacinSimsek, 2011). The literature showed that the teachers didn't have adequate knowledge and self-efficacy about the lessons conducted in out-of-school learning settings, and they felt anxious due to their inadequacy (Bozdogan, 2012; Griffin and Symington, 1997; Kisiel, 2005; Orion and Hofstein, 1994; Thomas, 2010). An achievement test based on the "Let's Solve the Riddle of Our Body" chapter was developed to examine the effectiveness of guidance material. This test was administered to experimental and control group students as the pretest, posttest, and retention test. Independent samples t-test was conducted to compare the pretest scores of experimental and control group students. According to the findings, it was found that there was no significant difference between the pretest scores of experimental and control group students(t(.05:29)=.897). These results showed that both groups were homogenous, which indicated appropriateness for an experimental study.

After the intervention in out-of-school learning settings, both groups of students were administered the LeSROBAT again as the posttest. The data were analyzed using one-way covariance analysis (ANCOVA) to check whether the intervention was effective by assuming the pretest results as the dependent variable. The findings revealed a significant difference between the scores of experimental and control group students in favor of experimental group [F(1-28)= 22.99 p<.05]. A body of research revealed that out-of-school learning settings had a positive effect on student achievement (Anderson, Lukas, Ginns and Dierking, 2000; Bozdogan, 2007; Bozdogan and Yalcin, 2006; Kuklaligil, 2012; Yavuz, 2012).Thus, the findings were consistent with the literature. It is considered that the learning through primary sources, by doing and experiencing, and through the interaction between and within groups has a positive role in student achievement. Ramey-Gassert (1997) expressed that out-of-school learning increased students' eagerness to learn and their motivation and attitude towards the lesson. Moreover, out-of-school learning provides students with a rich learning settingand facilitate students to construct the knowledge through concrete examples (Balkan Kiyici and AtabekYigit, 2010).

It was determined that the experimental group students had the most correct answers to the questions related to the topics of fresh and clean food and the harms of smoking and alcohol in the pretest. The students had a chance to learn about these topics from their family, bills and posters in their schools, and communication devices such as internet and television. Therefore, this condition is considered to be the reason of the high number of correct answers. On the other hand, the experimental group students had the least correct answers to the questions related to the topics of recognition of organs that had a role in digestion, the existence of different urinary ways in the body, and the health of urinary system in the pretest. The correct answer rate of these items was low since the students had less chance to encounter such questions in the real life.

The control group students had the most correct answers to the questions related to the topics of the necessity of nutrition for all creatures and the harms of smoking and alcohol in the pretest. It is considered that the students had a chance to learn about these topics from their family, school, and communication devices such as internet and television. They had the least correct answers to the questions related to the topics of the water and minerals that were in every nutrient, the transmission of nutrients after digestion through blood, the existence of different urinary ways in the body, and the concept of digestion in the pretest. This result was expected since these topics weren't as frequent as the harms of smoking and alcohol in real life and the students encountered with this topics in the school for the first time.

The experimental group students had the most correct answers to the questions related to the topics of the necessity of nutrition for all creatures, tooth types, and the existence of different urinary ways in the body in the posttest. These topics were involved in out-of-school learning settings such as dietitian, oral and dental health center, and dialysis center. It is considered that the reason of this situation was that the out-of-school learning settings provided the students with the primary sources and helped them keep the knowledge for a longer period of time (Balkan Kiyici, 2011; Balkan Kiyici and AtabekYigit, 2010; Pace and Tesi, 2004). It was observed that the experimental group students had the least correct answers to the question related to recognition of organs that had a role in digestion and the transmission of nutrients after digestion through blood in the posttest. In the digestion of food part, the students were taken to gastroenterology department and the lesson was conducted there. The low number of correct answers is considered to be sourced from incomprehension of the questions and the abstractness of the transmission of nutrients after digestion through blood. Moreover, the question related to the recognition of organs that had a role in digestion was asked by a picture where they were nested with the organs of urinary and digestion systems. The students had

misconceptions about the organs of digestion and urinary systems (Gungor and Ozgur, 2009). This might be the reason behind the low number of correct answers.

The control group students had the most correct answers to the questions related to the topics of the necessity of nutrition for all creatures, tooth types, tooth health and cleaning, and the harms of smoking and alcohol in the posttest. These topics were associated with the real-life activities that the students frequently conducted. Therefore, the number of correct answers to these questions was high. The least correct answers were given to the questions related to the topics of recognition of organs that had a role in digestion and the existence of different urinary ways in the body in the posttest. It is considered that the students weren't able to comprehend these topics enough in a traditional lesson.

The posttest was taken by 15 and 16 students from experimental and control groups, respectively. In line with this, the experimental group gave more or equal number of correct answers to all questions except for the questions 8 and 26 compared to control group. Both the 8th and the 26th questions were from the "food and its properties" part. The 8th question was about the fresh and natural food, while the 26th question was about the harms of smoking on environment. It is important since there is only one answer difference between the numbers of correct answers to these questions. The biggest difference between the experimental and control group was among the answers given to the 10th, 13th, 21st, 22nd, and 24th questions. The 10th question was from the "food and its properties" part was about fresh food. The 13th question was from the "digestion of food" and was about showing the place of organs that have a role in digestion on the model. The 21st and 22nd questions were from the "urinary in our body" part and were about accessory digestive organs. The 24th question was from the "food and its properties" part and was about diseases caused by the lack of vitamin. These topics were covered in a picnic in the school yard, faculty of medicine, dialysis center, and dietician in the experimental group. In other words, 4 out of 6 out-of-school learning settings had correct answers with the biggest difference. These findings showed that out-of-school learning settings and the guidance material had a positive effect on students' achievement. Plenty of research revealed that combining out-of-school learning experiences with objectives increased the educational effect of these activities (Anderson, Kisiel and Storksdieck, 2006; Rapp, 2005). In a study focused on the effectiveness of activities conducted before, during, and after going to out-of-school learning settings, Stoneberg (1981) found that a visit that lacked proper planning and preparation didn't help student learning. Rapp (2005) stated that long-term and repetitive out-of-school learning practices provided students with deep learning and comprehension and expressed that combining the out-of-school learning activities with the objectives specified in the curriculum and conducting following activities brought about cognitive and social benefits to the students. These studies showed that when the visit is planned well, when the students become active in out-of-school learning settings, and when the knowledge gained during out-of-school learning settings is reinforced through following activities, the students become successful cognitively and affectively in the lessons conducted in out-of-school settings most (Anderson, Kisiel and Storksdieck, 2006; Orion and Hofstein, 1991). From this perspective, the findings are consistent with the literature.

The retention test was administered to experimental and control group students 9 months after the posttest. Independent samples t-test was conducted in order to compare the students' scores obtained from the retention test. The analysis revealed no significant difference between the experimental group students' scores obtained from posttest and retention test at p<.05 level. Similarly, no significant difference between control group students' scores obtained from posttest and retention test at p<.05 level. However, the experimental group students had significantly higher scores from the retention test when compared with the control group students (t(.05:28)=3.65). When the experimental group students' scores obtained from the retention test were examined, it can be stated that these scores were higher than the scores obtained from the pretest and higher than or close to their posttest scores. The posttest scores of control group students were higher than or close to their pretest scores. Their retention test scores were close to their posttest scores. There are studies which have similar findings (Knapp, 2000; Pace and Tesi, 2004; Randler, Kummer, and Wilhelm, 2012) as well as different findings (Bozdogan, 2007; Yavuz, 2012). The reason why the retention was high in this study is considered to be sourced from the fact that all of the out-of-school learning activities (health institutes and school yard) were related to the students' real lives, which made it easier to establish a link between former knowledge and the knowledge that was learned in out-of-school learning settings. Falk and Dierking (1997) and Anderson and Pisticelli (2002) expressed that the knowledge that was learned in out-of-school learning settings is remembered for long. Moreover, it was found that the lessons conducted in out-of-school learning settings were effective in creating strong memories in a sociocultural context that would be remembered for a long time (Falk and Dierking, 2000).

The experimental group students had the most correct answers to the questions related to the topics of the food containing different types of vitamins, the harms of smoking and alcohol, and tooth types in the retention test. These topics are similar to those which had the most correct answers in the posttest. Anderson and Pisticelli (2002), Falk and Dierking (1997), and Turkmen (2010) stated that the knowledge that was learned in out-of-school learning settings was remembered for a long time. It is considered that the lessons conducted in out-of-school learning settings were kept in mind for a longer time. The experimental group students had the least correct answers to the questions related to the topics of the balanced and regular diet, recognition of organs that had a role in digestion, and the existence of different urinary ways in the body. The questions related to the recognition of organs that had a role in digestion also had low correct answers in the posttest. The reason behind this situation is considered to be the misconceptions about

organs of digestion and urinary systems (Gungor and Ozgur, 2009). Therefore, the students replied in a similar manner in the retention test. As for the low rate of correct answers to the questions about the topics of the balanced and regular diet and the existence of different urinary ways in the body, the age and social context of students are considered to have an effect on the retention of these topics.

The control group students had the most correct answers to the questions related to the topics of the harms of smoking and alcohol, tooth types, and tooth health in the retention test. Similarly, the reason behind the high rate of correct answers is considered to be the place of these topics in students' daily lives. They had the least correct answers to the questions related to the topics of the existence of different urinary ways in the body and diseases caused by the lack of vitamin. The question related to the existence of different urinary ways in the body had also low rate of correct answers in the posttest. Thus, it is considered that this topic wasn't able to be learned by the students. The topic of diseases caused by the lack of vitamin is considered not to be permanent since it isn't a topic that is frequently encountered in real life. The research showed that lessons conducted in out-of-school learning settings concreted the abstract concepts and enriched the learning context at school and science, contributed to the development of students' science skills, and helped students make a connection between the knowledge and the daily life (Bozdogan, 2007; Chin, 2004). From this perspective, the topics couldn't be permanent.

The number of correct answers given by the experimental group students to the questions 5, 11, 12, and 29 was higher in the retention test than the posttest. All of the questions were from the "food and its properties" part. The 5th and 29th questions were about the importance of a balanced and regular diet for human health. The 11th and 12th questions were about the harms of smoking and alcohol. The students were taken to a dietician and department of pediatric for the objectives related to these questions. Out-of-school learning settings help making connections between the knowledge and the daily life (Bozdogan, 2007; Chin, 2004). These findings were considered to be obtained because the students used what they learned in their daily lives.

The number of correct answers given by the control group students to the questions 2, 13, 24 and 29 was higher in the retention test than the posttest. The 2nd, 24th, and 29th questions were from the "food and its properties" part, while the 13th question was from the "digestion of food" part. The 2nd and 24th questions were about the vitamin types in different foods. The 13th question was about showing the place of organs that have a role in digestion on the model. The 29th question was about the balanced and regular diet. These topics were considered to have higher rate of correct answers in the retention test since the teacher focused on these topics again at the end of the topics.

The number of correct answers given to the questions of 3, 6, 10, 11, 15, 18, 19, 22, and 28 was slightly higher in the retention test when compared with the posttest. The 3rd, 6th, 10th, 11th, and 12th questions were from the "food and its properties" topic. The 3rd question was about the vitamin types in different foods. The 6th question was about the balanced and regular diet. The 10th question was about the fresh food. The 11th and 12th questions were about the harms of smoking and alcohol. The 15th, 18th, and 19th questions were from "digestion of food" topic. The 15th question was about tooth types. The 18th question was about the digestion organs. The 19th question was about the transmission of nutrients through blood. The 22nd and 28th questions were from "urinary in our body" topic. The 22nd question was about accessory digestive organs. The 28th question was about the health of urinary system. The control group teacher focused on these topics repeatedly due to the curriculum, which is considered to be the reason behind these findings.

Conclusion

The effect of out-of-school learning settings based on a guidance material on 5th grade students' achievement was examined by administering the achievement test to the experimental and control group students as the pretest, posttest, and the retention test. After the intervention in out-of-school settings within the framework of guidance material, the achievement test was administered to experimental and control group students as the posttest. When the results were compared, it was observed that the experimental group students had significantly higher scores than the control group students [$F_{(1-28)}= 22.99$ $p<.05$]. Accordingly, it was found that the out-of-school learning settings had an effect on students' learning. When the number of correct answers given by both the experimental and the control group students in the pretest was examined, it was observed that they gave more correct answers to the questions related to the topics that the students encountered in their environment and school frequently. The students gave less correct answers to the questions related to the topics that they encountered in their lives less frequently. When the experimental and control group students' lowest rate of correct answers were examined, it was observed that the questions related to topics that the students didn't encounter with frequently in their daily lives had the least correct answers. Accordingly, it was inferred that the topics that were frequently encountered by the students in their daily lives were learned better informally.

The experimental group students gave the most correct answers to the questions related to the necessity of nutrition for all creatures, the vitamin types in different foods, tooth types, tooth health, and the existence of different urinary ways in the body in the posttest. It was observed that these topics were covered in out-of-school learning settings such as dietician, oral and dental health center, and dialysis center. The control group students gave the most correct answers to the questions related to the necessity of nutrition for all creatures, placing tooth types on the model, tooth

health and cleaning, and the harms of smoking and alcohol in the posttest. It was observed that these topics were frequently encountered by the students in their daily lives and were able to be learned informally. That was the reason of high rate of correct answers. The questions that the experimental and control group students gave most correct answers were similar. However, the experimental group students gave more correct answers to the questions related to urinary system and the vitamin types in different foods. This situation showed that the experimental group students learned about the topics that they didn't frequently encountered in their lives better.

The experimental group students gave least correct answers to the questions related to recognition of organs that had a role in digestion and the transmission of nutrients after digestion through blood. The gastroenterology department was visited for the digestion of food topic, and the lesson was conducted there. The control group students gave less correct answers to the questions related to recognition of organs that had a role in digestion, as well. The questions might not be well understood by the students. Moreover, why the question related to the transmission of nutrients after digestion had low correct answers might be the students' cognitive levels. This topic might not be appropriate for the students since they were at the concrete operational stage. The control group students gave least correct answers to the questions related to recognition of organs that had a role in digestion and the existence of different urinary ways in the body. It was inferred that these topics weren't understood well by the students in the lessons based on the current curriculum.

The number of correct answers given by the experimental and control group students in the posttest were compared in terms of each item. 15 students in experimental group took the posttest, while 16 students in the control group took the posttest. In line with this, the experimental group gave more or equal number of correct answers to all questions except for the questions 8 and 26 compared to control group. The biggest difference between the experimental and control group was among the answers given to the questions related to fresh food, showing the place of organs that have a role in digestion on the model, accessory digestive organs, and diseases caused by the lack of vitamin. These topics were covered in a picnic in the school yard, faculty of medicine, dialysis center, and dietician in the experimental group. In other words, 4 out of 6 out-of-school learning settings had correct answers with the biggest difference. These findings showed that out-of-school learning settings and the guidance material had a positive effect on students' achievement.

The retention test was administered to experimental and control group students 9 months after the posttest. The analysis revealed no significant difference between the experimental group students' scores obtained from posttest and retention test at p<.05 level. The experimental group students had significantly higher scores from the retention test when compared with the control group students (t(.05:28)=3.65). This situation showed that the knowledge that was learned in out-of-school learning settings was remembered for longer a longer period of time.

The experimental group students gave most correct answers to the questions related to the vitamin types in different foods, the harms of smoking and alcohol, and tooth types in the retention test. These topics were similar to the topics that had the most correct answers in the posttest. The control group students gave most correct answers to the questions related to the harms of smoking and alcohol, placing tooth types on the model, and tooth health in the retention test. Similarly, it was concluded that the reason of high correct rate was that the students frequently encountered with these topics in their daily lives. Apart from control group, the experimental group students gave more correct answers to the questions related to vitamin types in different foods. It was inferred that the students remembered this topic because they learned it in out-of-school learning settings by experiencing.

The experimental group students gave least correct answers to the questions related to balanced and regular diet, recognition of organs that had a role in digestion, and the existence of different urinary ways in the body in the retention test. The question related to the recognition of organs that had a role in digestion had low correct answers in the posttest as well. The reason why the students gave least correct answers to the question related to the existence of different urinary ways in the body and balanced and regular diet was considered to be related to students' age and their social context in which they encountered these topics frequently. The control group students gave least correct answers to the questions related to the existence of different urinary ways in the body and the diseases caused by the lack of vitamin in the retention test. The question related to the existence of different urinary ways in the body had low correct answers in the posttest as well. Moreover, the experimental group students also gave least correct answers to this question. It considered that this topic wasn't learned by the students since it wasn't appropriate to their age and cognitive development. It was also considered that the topic about the diseases caused by the lack of vitamin wasn't learned well by the students because the students didn't encounter with that topic informally. On the other hand, this question had the highest correct answer rate in the experimental group in the retention test. It was concluded that the experimental group students learned this topic better through the out-of-school learning settings.

Recommendations

Based on the results of this research, the following suggestions have been made respectively.

1. It was concluded that the guidance material which was developed within the scope of this study had a positive effect on student achievement. Therefore, the science teachers can benefit from this material in their out-of-school learning activities.

2.   Curriculums should involve out-of-school learning settings more because the students learn knowledge more permanently in these settings.

3.   It was observed that the students were able to make better connections with what they informally learned and what they learned at school. In line with this, more public service ads, bills and posters should be incorporated.

4.   Since the guidance material increased the students' academic achievement, guidance materials that can be used in out-of-school learning settings should be prepared and presented for different units, ages, and lessons.

5.   The current teachers and administrators should be informed about the importance of out-of-school learning settings through in-service trainings, and they should be encouraged to conduct these types of activities.

6.   The curriculums of teacher education institutions should involve lessons focusing on out-of-school learning settings, and the teacher candidates should be provided with the opportunity to practice these activities.

7.   The individuals who will guide the out-of-school learning activities should be selected before the visit since they are required to be informed.

8.   The topics of transmission of nutrients through blood and the existence of different urinary ways in the body are recommended to be concretized since the 5th graders are at the concrete operational stage.

9.   Similar works can be done at different class levels and different chapters.

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