

The Assessment of Multiple Writing Activities in Teaching the "Ecosystem Ecology" Subjects¹

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In this study, the effect of multiple writing activities in teaching "Ecosystem Ecology" subjects on the academic achievements of students was analyzed. The study was conducted in a high school in the Kaynarca district of the Sakarya province in the second term of the 2018-2019 academic years. The sample of the study consists of 48 students studying in the 10th grade. 48 students, which formed the sample, randomly formed Experiment 1 and Experiment 2 groups. While the Experiment 1 group was taught the "Ecosystem Ecology" subjects with traditional teaching methods (direct instruction-catechize), the Experiment 2 group was taught with multiple writing activities. The study is a quantitative research and the data were collected by using pretest-posttest with a quasi-experimental control group. The "Ecosystem Ecology" success test that was developed by the researcher was applied as the pre-test and post-test in the study as the data collection tool. The obtained data were analyzed by using the SPSS 20 statistical program with Mann Whitney-U Test" and "Wilcoxon Sign Rank Test". Analysis results showed that compared to the traditional teaching method, teaching "Ecosystem Ecology" subjects by using multiple writing activities positively affected the student's success.

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Keywords: Academic achievement, biology education, ecosystem ecology, multiple writing activities

INTRODUCTION

In today's world and in the future, sciences are the strongest tools for a nation to improve in social, cultural, economic, and technological aspects. Therefore, creating a qualified human power can only be ensured by carrying out effective science education in schools starting from primary education (Kaptan & Korkmaz, 2001). Science education includes physics, chemical, biological sciences, and disciplines related to these sciences. Within science education, the science of Biology is a rapidly developing science examining living organisms unlike the sciences of physics and chemistry. New information and developments in biological science enter our daily life in the form of new technologies. These developments directly affect human life and for this reason, it is obvious that biology education is very important (Altunoğlu & Atay, 2005). In this context, the science of biology has been included in the primary and secondary education syllabus as a part of science class or as a separate field. The science of biology, since it consists of verbal and Latin concepts in terms of content, effective and permanent education of the content and improving its quality is necessary. The quality of biology education depends on the quality of the education given in the class. Among the students in the classroom environment, there are individual differences in terms of intelligence, comprehension, skills, manners, apprehension, motivation, and success (Anupam, 2014).

These individual differences affect the learning in the classroom. Various teaching and learning strategies have been developed in order to facilitate learning in class. Learning and teaching strategies are effective when they cause the desired change in the student's behavior. If the learning and teaching strategies are effective in enhancing the success of the students, it is inevitable to teach students with more effective, efficient, and appropriate teaching approaches (Gladys, 2014). Starting from here, one of the education approaches applied in biology education in recent years is the teaching done with multiple writing activities.

When the literature is examined, it is seen that there have been statements on how writing was formed in the 1980s and how this process supported learning. According to these statements, it was assumed that writing was a goal-oriented activity focusing on solving problems where writers use certain strategies to create and review texts (Bereiter & Scardamalia, 1987; Flower & Hayes, 1980, 1984). Based on this assumption, Bereiter and Scardamalia (1987) conceptualized writing as the effect of changing the content explicitly through correction strategies according to the learning outcomes. This point of view indicated that

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learning from writing emerged as a result of adding to, removing from, or rearranging an existing text with the aim of meeting a goal about a subject, and then meeting the reader's needs. According to this opinion, students learn from writing when they focus on changing drafts explicitly to determine to what extent their writings are sufficient for the complexity of the subject, represent their knowledge, and clear and interesting for other readers (Bereiter & Scardamalia, 1987). In this context, Mason and Boscolo (2000) stated that writing is a way used for thinking of an event, putting forward its reasons, and explaining discussions. Among writing strategies for learning, Hohenshell and Hand (2006), on the other hand, drew attention to elements in the nature of the language such as comprehension, conveying and defining existing thoughts, and creating new products. Studies (Keys, 2000; Shanahan, 2004; Sperling & Freedman, 2001) showed that multiple writing activities in the classroom environment can be applied in two ways. The first one of these is expressing any idea with its proofs, writing reports, reviewing the text, planning and evaluating; the second one is the student canalizing their knowledge, descending, and improving (Akçay et al., 2014).

The benefits of using multiple writing activities in the classroom environment in different fields were emphasized in the studies conducted. According to Hand et al. (2002), multiple writing activities in teaching science enable students to understand the information they learn in their own language without literally repeating, thus by contributing to them making strong connections between concepts, increasing their conceptual perceptions. Mason and Boscolo (2000) stated that students practice conceptual changes easier with multiple writing experiences. Lawwill (1999), on the other hand, stated that students think on concepts longer while writing, and develop their thinking skills by making connections between their former and new knowledge. In multiple writing activities, after learning the subject, students internalize it and write down what they learned with their sentences and create their own products. Since students think about subjects and evaluate on their own, efficient and permanent learning is actualized. Besides, the thinking, evaluating, and criticizing skills of students are also improved (Uluğ, 2004).

There have been a great number of studies on the use of multiple writing activities in science education as a learning tool in recent years. These studies focused on different aspects of multiple writing activities (Prain, 2006; Scheppegrell, 1998; Tynjala et al., 2001; Unsworth, 2000; 2001). For instance, they can be counted as determining cognitive processes regarding different writing activities and how multiple writing improves learning (Galbraith, 1999; Klein, 1999, 2006), determining the effects of multiple writing activities on student's learning (Hand et al., 2004; Hand et al., 2002; Hildebrand, 1998; Scheppegrell, 1998; Unsworth, 2001), and analyzing its effects on the learning outcomes of different readers (Rijlaarsdam & Couzijn, 2002; Rijlaarsdam et al., 2006; Tynjala et al., 2001). Also, results of national and international studies (Akçay & Baltacı, 2017; Akkuş et al., 2007; Akyol & Dikici, 2009; Çardak, 2010; Demircioğlu et al., 2002; Duru & Gürdal, 2002; Erol, 2010; Günel et al., 2009; Hand et al., 2004; Hand et al., 2002; Hohenshell & Hand; 2006; Mason & Boscola, 2000) revealed that different writing activities in science classes increase science achievements of the students. Similar results were also seen in subject-oriented studies conducted in limited numbers with multiple writing activities in biological science (Duymaz & Özer Keskin, 2011; Hand et al., 2004; Özyurt & Akçay, 2011). Thus, the focus of the study is how the teaching carried out with multiple writing activities including letter, poem, story, drawing, column, and interview on "Ecosystem Ecology" subjects affect the academic achievements of the students in biology education, and considering the individual differences of the students as each student has different individual characteristics in the classroom environment. The purpose of this study is to analyze the effect of multiple writing activities in teaching "Ecosystem Ecology" in biology class on the academic achievements of the students. In scope of this purpose, answers to the questions below were sought. Is there a significant difference between the academic achievement score means of the students of Experiment 1 and Experiment 2 groups after the application? Is there a significant difference between the academic achievement score means of the students of Experiment 1 and Experiment 2 groups before and after the application?

RESEARCH DESIGN and METHOD

Research Model and Study Group

In this study, pretest-posttest quasi-experimental model was used in the collection of the data. The study comprises "Ecosystem Ecology" subjects with 48 students in 10th grade. Experiment 1 and Experiment 2 groups were randomly selected among 48 students making up the sample. While the Experiment 1 group

was taught the "Ecosystem Ecology" subjects with traditional teaching methods (direct instruction-catechize), the Experiment 2 group was taught with multiple writing activities.

Data Collection Tool

The "Ecosystem Ecology" success test was developed by the researcher to measure the academic success of the Experiment 1 and Experiment 2 groups on "Ecosystem Ecology". While preparing the "Ecosystem Ecology" success test, learning outcomes of "Ecosystem Ecology" subjects regarding the Ministry of National Education high school 10th-grade biology class were taken into consideration. The "Ecosystem Ecology" success test consists of 25 multiple-choice questions. The "Ecosystem Ecology" success test was applied to Experiment 1 and Experiment 2 groups as a pretest before the study and posttest at the end.

Application

The research was conducted with 48 students in total studying in 10th grade in a high school in the Kaynarca district of the Sakarya province in the second term of the 2018-2019 academic years. In the scope of the study, "Ecosystem Ecology" subjects were taught by the researcher in Experiment 1 and Experiment 2 groups and it took eight weeks (16 hours). At the beginning of the application, the "Ecosystem Ecology" success test was applied to Experiment 1 and Experiment 2 groups as a pretest. In the application, "Ecosystem Ecology" subjects were taught to students in the Experiment 1 group through traditional teaching methods. During the lesson, the information students learned in the previous lesson were tested in question & answer form and different visual materials were benefited from. The activities got done were limited with textbook and workbook. In Experiment 2 group, on the other hand, for "Ecosystem Ecology" subjects, practices consisting of letter, poem, story, drawing studies, column, and interview activities were done from the multiple writing activities. For this purpose, 12 activities were prepared and used in in-class practices. At the end of the application, the "Ecosystem Ecology" success test was applied to Experiment 1 and Experiment 2 groups as a posttest.

Analysis of the Data

"Mann Whitney-U Test" and "Wilcoxon Sign Rank Test" were used to determine the effect of the application on the academic achievements of the students in Experiment 1 and Experiment 2 groups.

RESULTS

This study was carried out to determine the effect of multiple writing activities in teaching "Ecosystem Ecology" subjects on the academic achievements of the students. The obtained data were interpreted by analyzing according to sub-problems expressed from the point of students in Experiment 1 and Experiment 2 groups.

Before the multiple writing activities, the "Ecosystem Ecology" success test was applied as a pretest to determine if there was a significant difference between the academic achievement scores of the students in Experiment 1 and Experiment 2 groups. Pretest data obtained were analyzed with the "Mann Whitney-U Test" and the results are given in Table 1 and Graphic 1.

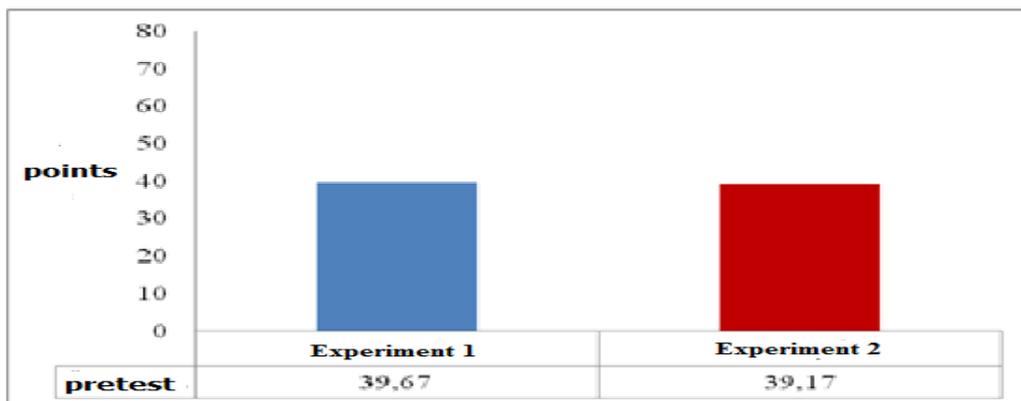
Table 1: "Mann Whitney-U Test" Results Regarding the Academic Achievement Test Scores of the Students in Experiment 1 and Experiment 2 Groups Before the Application

Scales	Group	N	Rank Mean	Rank Sum	U	p
Academic Achievement	Experiment 1	24	24.94	598.50	277.500	.827
	Experiment 2	24	24.06	577.50		

** $p < .01$; * $p < .05$

When analysis results in Table 1 are examined, it is seen that there is not a statistically significant difference between the academic achievements of the students in Experiment 1 and Experiment 2 groups before the application ($U = 277.500$; $p > .05$). Academic achievement pretest mean scores of the students forming Experiment 1 and Experiment 2 groups were given in Graphic 1. When Graphic 1 is examined, it is

seen that academic achievement pretest mean scores of the students in Experiment group 1 ($\bar{X}= 39.67$) and Experiment group 2 ($\bar{X}= 39.17$) were close.



Graphic 1: Academic achievement means scores of the students in Experiment 1 and Experiment 2 groups before the application

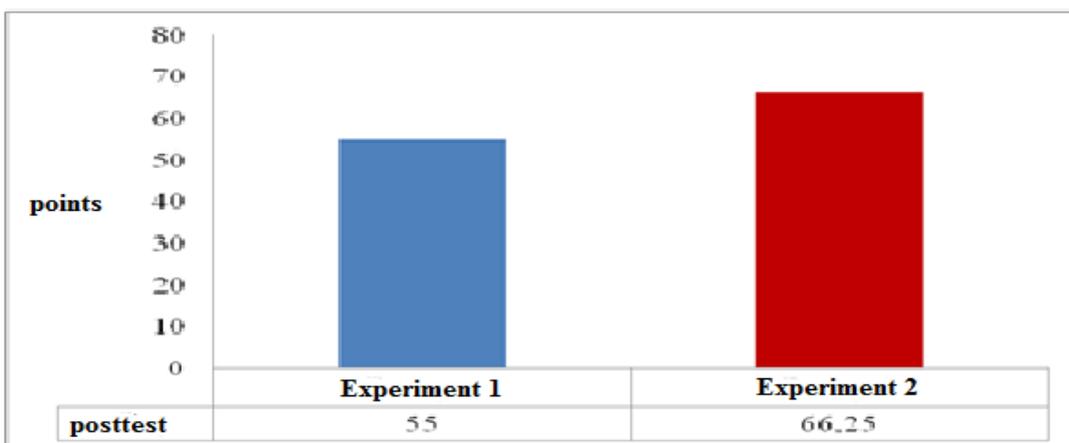
After the application, posttest data of the academic achievement test applied to determine if there was a significant difference between the academic achievements means scores of the students forming Experiment 1 and Experiment 2 groups were analyzed with "Mann-Whitney-U Test". The results of this analysis are given in Table 2 and Graphic 2.

Table 2: "Mann Whitney-U Test" Results Regarding the Academic Achievement Test Scores of the Students in Experiment 1 and Experiment 2 Groups after the Application

Scales	Group	N	Rank Mean	Rank Sum	U	p
Academic Achievement	Experiment 1	24	19.92	478.00	178.000	.023*
	Experiment 2	24	29.08	698.00		

** $p < .01$; * $p < .05$

When analysis results in Table 2 are examined, it is seen that there is a statistically significant difference between the academic achievement mean scores of the students in Experiment 1 and Experiment 2 groups after the application ($U= 178.000$; $p < .05$). The data in Graphic 2 verify this result.



Graphic 2: Academic achievement means scores of the students in Experiment 1 and Experiment 2 groups after the application

When Graphic 2 is examined, while the academic achievement posttest mean scores of the student in Experiment 1 group is $\bar{X}= 55$, the academic achievement posttest mean scores of the students in Experiment 2 group is $\bar{X}= 66.25$. According to this result, it was seen that multiple writing activities applied in teaching "Ecosystem Ecology" subjects had a significant effect on the increase on the academic achievement mean scores of the students in Experiment 2 group.

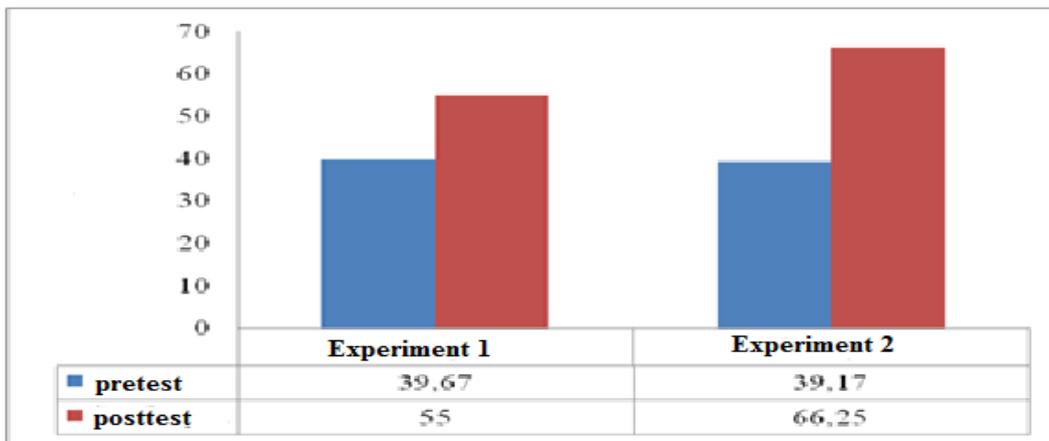
Pretest and posttest data of the academic achievement test applied to determine if there was a significant difference between the academic achievements means scores of the students forming Experiment 1 and Experiment 2 groups before and after the application were analyzed with the "Wilcoxon Sign Rank Test". Analysis results are presented in Table 3 and Graphic 3.

Table 3: "Wilcoxon Sign Rank Test" Results Regarding the Academic Achievement Test Scores of the Students in Experiment 1 and Experiment 2 Groups Before and After the Application

Group	Scales	Group	N	Rank Mean	Rank Sum	z	p
Experiment 1	Academic Achievement	Negative	1	2.00	2.00	-4.062a	.000**
		Positive	21	11.95	251.00		
		Equal	2				
Experiment 2	Academic Achievement	Negative	1	1.00	1.00	-4.171a	.000**
		Positive	22	12.50	275.00		
		Equal	1				

** $p < .01$; * $p < .05$ a. Based on negative ranks

When Table 3 is examined, it was found that there is a significant difference between the academic achievement mean scores of the students forming Experiment 1 ($z= -4.062$; $p=.000$) and Experiment 2 ($z= -4.171$; $p = .000$) groups before and after the application. Data in Graphic 3 verify these results obtained.



Graphic 3: Academic achievement means scores of the students in Experiment 1 and Experiment 2 groups before and after the application

When Graphic 3 is examined, before and after the application, while the pretest and posttest mean scores of the academic achievements of the students in Experiment 1 group are $\bar{X}= 39.67$, $\bar{X} = 55$ respectively, pretest and posttest score means of the academic achievements of the students in Experiment 2 group are $\bar{X}= 39.17$, $\bar{X}= 66.25$ respectively. While the increase in the academic achievement scores of the students in the Experiment 1 group is 38.6%, the increase in the academic achievement scores of the students in the Experiment 2 group is 69.1%. According to these results, the multiple writing activities applied in teaching "Ecosystem Ecology" subjects caused the academic achievement scores of the students in the Experiment 2 group to increase more.

CONCLUSION AND DISCUSSION

In this study; Whether teaching "Ecosystem Ecology" topics using multiple writing activities has an effect on students' academic achievement has been investigated. It was seen that there was not a significant difference between the academic achievement pretest mean scores of the students in Experiment 1 ($\bar{X} = 39.67$) and Experiment 2 ($\bar{X} = 39.17$) groups before the application. This situation shows that before the application, both groups were equal in terms of academic achievement.

According to the results obtained from the study, it was seen that after the application, there was a statistically significant difference between the academic achievement mean scores of the students in Experiment 1 ($\bar{X} = 39.67$, $\bar{X} = 55$) and Experiment 2 ($\bar{X} = 39.17$, $\bar{X} = 66.25$) groups. This result revealed that the application carried out with multiple writing activities had more effect on the increase in the academic achievements of the students in the Experiment 2 group. It was also concluded in the study that students in Experiment 2 group where applications with multiple writing activities were carried out were more successful compared to the students in Experiment 1 group where applications were carried out according to traditional teaching. The results of this study are similar to the results of many studies done previously in science education and different disciplines (Akkuş et al., 2007; Akyol & Dikici, 2009; Çardak, 2010; Demircioğlu et al., 2006; Dilber, 2006; Duru & Gürdal, 2002; Erol, 2010; Günel et al., 2009; Hand, Wallace & Yang, 2004; Hand, Hohenshell & Prain, 2004; Hand et al., 2002; Hohenshell & Hand, 2006; Mason & Boscola, 2000). The results of these studies, as in the study conducted, showed that multiple writing activities are more effective on the increase in the academic achievement levels of the students. Mason and Boscolo (2000) stated that multiple writing activities play a great role in the actualization of learning and therefore the increase in academic achievement since writing, apart from the act of taking notes which is its traditional meaning, gives meaning to activities. Also, multiple writing activities improve the discernment and expression power and criticizing skills by associating the existing knowledge of the students with new concepts. Apart from that, multiple writing activities are also important in terms of enabling students to be freer in conveying their knowledge (Levin & Wagner, 2006). For this reason, considering the results of the studies conducted, teaching lessons by using multiple writing activities in science, and especially biology, teaching is important. In biology lessons taught by using multiple writing activities, learning can be actualized more efficiently, and this may make the academic achievements of the students increase.

Generally, the effect of multiple writing activities on the academic achievements of the students was determined in the studies conducted. The research is limited to 48 students who are 10th grade students studying in a high school in Kaynarca district of Sakarya province. Similar studies can be done with different student groups. Also in future studies, it may be suggested to carry out research to determine the effect of multiple writing activities on the affective domain characteristics of the students.

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