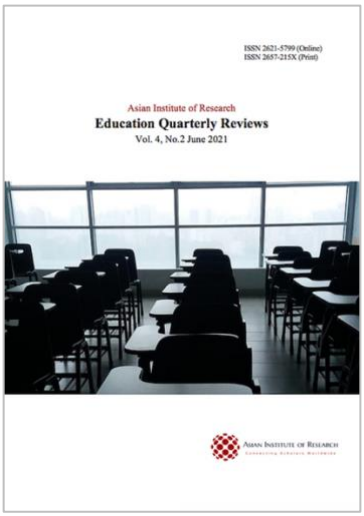

Education Quarterly Reviews

Demirci, Tuba, and Okur, Sema. (2021), The Effect of Teaching Science through Storytelling on Students' Academic Achievement, Story Writing Skills and Opinions about Practice. In: *Education Quarterly Reviews*, Vol.4, No.2, 562-578.

ISSN 2621-5799

DOI: 10.31014/aior.1993.04.02.301

The online version of this article can be found at:
https://www.asianinstituteofresearch.org/

Published by:
The Asian Institute of Research

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The Asian Institute of Research
Education Quarterly Reviews
Vol.4, No.2, 2021: 562-578
ISSN 2621-5799

DOI: 10.31014/aior.1993.04.02.301

The Effect of Teaching Science through Storytelling on Students' Academic Achievement, Story Writing Skills and Opinions about Practice

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Abstract
This study aims to compare the effect of storytelling in teaching on students' academic achievement with the traditional teaching method. In addition, it aims to reveal the effect of story education given to students on students' story writing skills and their opinions regarding storytelling in teaching. The study was carried out in a public primary school. The mixed research method was employed in the study. A total of 61 primary school 3rd-grade students, 31 experiments and 30 controls, participated in the study. The "Academic Achievement Test" was applied to the experimental and control group students to collect quantitative data. The journey to the world of living beings unit was taught in the experimental group for four weeks by using the stories prepared by the researcher. At the end of each lesson, the students were asked to write a science story on the subject. The "Story Writing Skills Evaluation Scale" was used to determine the change in the story writing skills of the experimental group students, and the "Student Opinion Form on Storytelling" was used to reveal the students' thoughts about storytelling in teaching activities. The traditional teaching method was used in the control group. The quantitative data used in the study were analyzed using the SPSS statistical software. The qualitative data were analyzed using content analysis. Among the quantitative findings of the study, while there was no significant difference found between the pre-test mean scores of the experimental and control groups achievement test, a significant difference was found between the post-test scores in favor of the experimental group. The other quantitative finding of the study, in the evaluation of story writing skill, a significant difference was found between the first and the last story in favor of the last story. Positive findings were also obtained in the qualitative dimension of the study, such as the experimental group students are not unfamiliar with stories, it is fun for them to use in science lessons, and can be used in other lessons.

Keywords: Storytelling, Science Teaching, Academic Achievement, Writing Skill, Student Opinions

1. Introduction

1.1. Problem Definition

Storytelling in teaching is one of the methods used to embody abstract concepts. It is a technique that uses stories that students have heard from their families and people around them since their childhood. This technique is carried

out by reading the stories that the teacher has prepared in accordance with the subject. The reason behind this method is to provide students with permanent learning rather than giving information by rote (Kaptan & Korkmaz, 1999). With storytelling in teaching, the learning process is spread out in a certain order and over a long period. In this process, the teacher determines the subject, designs the storyline appropriate to the subject, determines the characteristics of heroes in the story, and prepares an interdisciplinary plan aimed at solving the problems of the subject and enabling the student to adapt the process to the problems they may encounter in real life. Students try to solve the problem they encounter in the lesson by using their imagination. Since students are actively involved in the course throughout the process, meaningful learning takes place.

There are many definitions for the story in the literature. The Turkish Language Association defines the story as "the type of writing that tells the fictional or nonfictional events." According to Gökçe (2011), stories are texts written in line with the axis of the event or situation that have a long-lasting and a certain tradition from the past to the present. Parlatır (1998), on the other hand, defined the story as the written or oral narration of real or fictional events. The storytelling technique has been developed in Scotland. This technique is based on making the learned information mentally meaningful by the student and being easily remembered. The storytelling technique utilizes the students' willingness to create a story. Thus, it is ensured that students achieve a sense of responsibility in their individual learning activities (Yiğit & Erdoğan, 2008; Köse & Yıldırım, 2019).

Today, having 21st-century skills is very essential for teachers. The concretization of the concepts to be taught to students is important in terms of meaningful learning. In particular, when primary school children are considered, the fact that many concepts to be taught in the science course are not directly observable by children, making it difficult for them to understand the topics of this course. The inability of students to configure the information given in the lessons correctly in their minds leads to mislearning. Therefore, it is important to benefit from various teaching methods and activities in lessons where difficult concepts are taught. Teaching the lesson with the support of storytelling leads students to concretize the concepts in their minds. According to the constructivist approach, being active in the lesson is essential for students in order to construct knowledge. Based on the fact that the constructivist approach suggests that stories have an important effect on children's learning, in this study, teaching activities were carried out with stories that students are active in the learning process in the light of a constructivist approach. In the study, storytelling in teaching and story-writing activities were carried out together for the active participation of the students. Writing is one of the tools that provides effectiveness in the communication process (Carter, Bishop & Kravits, 2002). In addition, writing is one of the four basic language skills in the Turkish course. Göçer (2016) defines writing as the transfer of one's emotions, dreams, ideas, and experiences on paper. Therefore, the study is generally defined as storytelling activities in teaching.

1.2. The Significance of the Study

Realizing the problems that exist in the stories they read and producing solution ideas improves students' problem-solving skills while creating a different storyline improves their creativity and imagination. Also, the stories support the language development of the students (Turgut & Kışla, 2015). In the literature, it has been stated that when storytelling activities are used in teaching, students feel comfortable, make connections between the information they have learned, can easily recall the learned information later and it is also stated that storytelling is effective on cognitive and affective characteristics (Öztürk & Otluoğlu, 2002).

When the studies examining the effects of storytelling activities in teaching on the academic achievement of students are reviewed, studies that reveal a significant difference in terms of academic achievement are frequently encountered. In the groups where storytelling in teaching activities was carried out, a remarkable difference was obtained in terms of academic achievement as well as meaningful and permanent learning (Yalnız, 2012; Özden, 2012; Arslan, 2014; Ünver, 2015; Külekçi, 2018). Another important aspect of storytelling in teaching is to develop students' imaginations. Students can improve their imagination and creativity by expressing the concepts in their minds. One of the ways to achieve this is for students to write their own stories. Studies involving story-writing activities that will contribute to the development of primary school students' creativity are rare in the literature (Gölcük, 2017). The present study is considered significant in terms of contributing to filling this gap in the literature.

In this study, besides analyzing academic achievement, which has been examined frequently in the literature, the effect and development of story writing skills, which was not examined before at the third grade level of primary school, was examined. Since it is thought it will contribute to the literature and will improve the writing skills of 3rd-grade primary school students, the present study is considered significant.

This study aims to reveal the effect of storytelling in teaching activities on the academic achievement of 3rd-grade students, their attitudes towards the lesson, their development in story writing skills, and their opinions about the process.
In this study, answers to the following questions are sought. These research questions are as follows:

1. Is there a statistically significant difference in the academic achievement of the experimental and control group students before and after the teaching activities?
2. Is there a statistically significant difference in the story writing skills of the experimental group students after the storytelling in teaching activities?
3. What are the experimental group students' opinions about the storytelling in teaching activities after the implementation?

2. Method

Research questions have a very significant role in determining the research method. In some cases, using only qualitative or quantitative research methods alone may not be sufficient to reach the answers to research questions. In this case, the mixed method, which includes both qualitative and quantitative methods, is used. In this study, the mixed research method, in which quantitative and qualitative research methods are used together, was used. The most significant feature of the mixed method is the demonstration of the research results with quantitative data, as well as the explanation of the reasons behind these results with qualitative data (McMillan & Schumacher, 2006).

2.1. Participants

The study was carried out in a public primary school in Gazipaşa district of Antalya province in the spring semester of the 2018-2019 academic year. A total of 61 primary school third-grade students, 31 experiments and 30 controls, participated in the study. In the quasi-experimental method, the sampling can be selected from easily accessible and feasible units. The convenience sampling method was used in the study.

2.2. Research Process

The study was initiated after prior necessary permissions were obtained from the Directorate of National Education and Alanya Alaaddin Keykubat University Ethics Committee (Table 1).

Table 1: Implementation Process of the Study

Weeks	Experimental Group	Control Group
Week 1 14.03.2019	Academic Achievement Test Lecture with interactive smartboard	Academic Achievement Test Lecture with interactive smartboard
Week 2 18.03.2019	“Word Game” Activity "Envisaged your story" activity "List Writing" Activity "Story mise-en-scene" Activity	Lecture with interactive smartboard Teacher guide book Question-answer technique Topics summary
Week 3 19.03.2019	"Story Types" Activity "Story Sections" Activity "Bright Ideas House" Activity "Story Completion" Activity	Lecture with interactive smartboard Teacher guide book Question-answer technique Topics summary
Week 4 25.03.2019	Lecture with interactive smartboard Story Reading	Lecture with interactive smartboard Teacher guide book

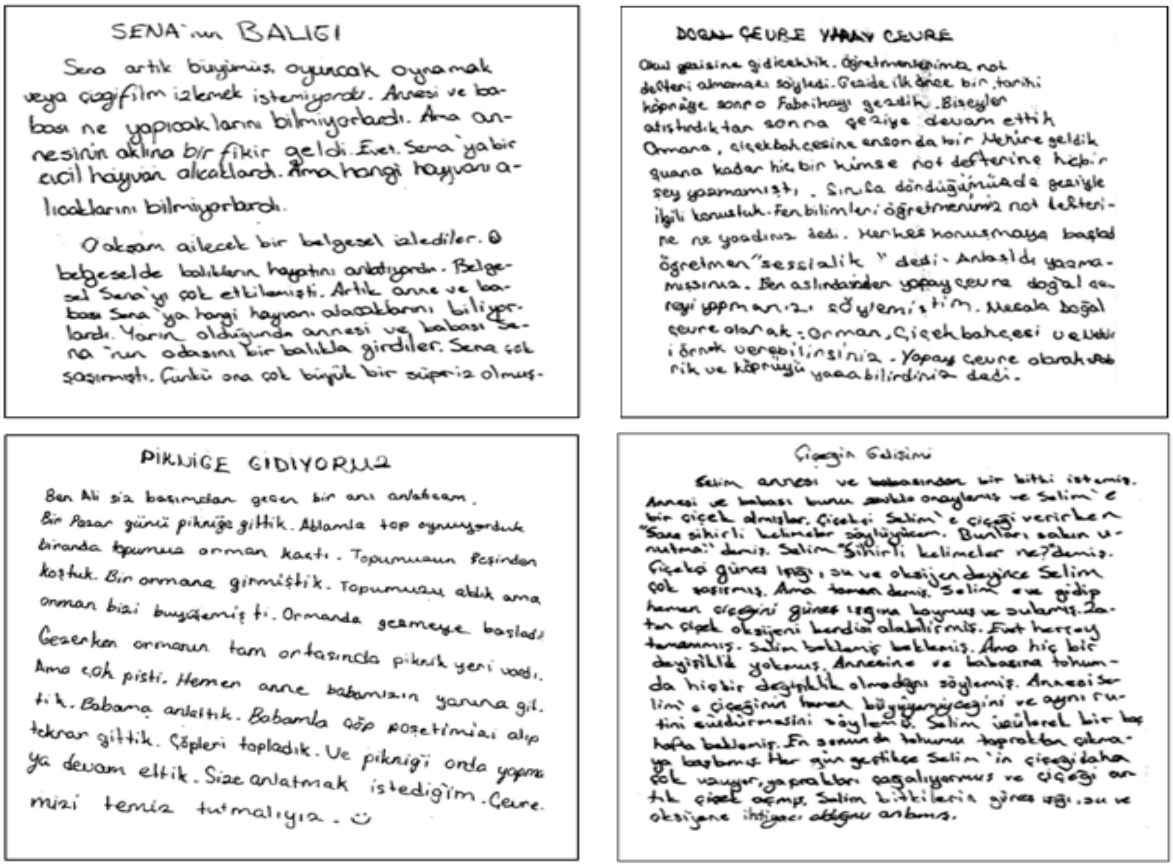
	Or Am I Alive Too? Story Writing Exercise	Question-answer technique Topics summary
Week 5 04.04.2019	Lecture with interactive smartboard Story Reading Adventurous Friends Story Writing Exercise	Lecture with interactive smartboard Teacher guide book Question-answer technique Topics summary
Week 6 11.04.2019	Lecture with interactive smartboard Story Reading There Is No Other World I Can Live In Story Writing Exercise	Lecture with interactive smartboard Teacher guide book Question-answer technique Topics summary
Week 7 18.04.2019	Lecture with interactive smartboard Story Reading Little Seed Became a Giant Tree Story Writing Exercise	Lecture with interactive smartboard Teacher guide book Question-answer technique Topics summary
Week 8 25.04.2019	Story Reading Activity Fun Science Stories Filling out the "My Book" Form Lecture with interactive smartboard	Lecture with interactive smartboard Teacher guide book Question-answer technique Topics summary
Week 9 05.05.2019	Academic Achievement Test Student Opinion Form on Storytelling Lecture with interactive smartboard	Academic Achievement Test Lecture with interactive smartboard

Academic Achievement Test was applied to control and experimental groups. The study covers nine weeks in total. Pre-Tests were applied to the control and experimental groups before the beginning of the study. Then, in the 2nd and 3rd weeks, the experimental group students were given story writing training in Turkish courses within the scope of storytelling activities for 4 hours a week. Story activities for each activity were distributed to all students in the experimental group. In the experimental group, in the 4th, 5th, 6th, and 7th weeks, science lessons were carried out with the stories prepared by the researcher related to the topics and objectives of the related curriculum (Table 2), then the students were asked to write a story about the topic.

Table 2: Stories and Learning Outcomes

Name of the Story	**Learning Outcomes**
Or Am I Alive Too?	Classifies entities as living and non-living, using examples in their environment.
Adventurous Friends	Identifies the differences between natural and artificial environments.
There Is No Other World I Can Live In	Recognizes the environment in which they live.
	They take an active part in the cleaning of their environment.
Little Seed Became a Giant Tree	Presents the results of observations of the life cycle of a plant.

Picture 1 shows different examples of stories written by students every week in accordance with the learning outcomes.



Picture 1: Examples of students' stories

2.3. Data Collection Tools

This section presents the data collection tools used in the implementation process of the study. In this study, quantitative data were collected using the "Academic Achievement Test and Story Writing Skills Evaluation Scale," and qualitative data were collected using "Student Opinion Form on Storytelling." Validity and reliability are two essential features for every measurement tool. Reliability refers to consistently achieving the same result by using the same measurement tool under the same circumstances. Validity refers to the degree to which an instrument accurately measures what it intends to measure without mixing with another feature (Demirali & Ergin, 1995). This section provides detailed information on the validity and reliability of data collection tools.

2.3.1. Academic Achievement Test

The academic achievement test was designed by the researcher in line with the subjects and goals in the curriculum by examining the relevant units of the 3rd-grade science textbooks. In order to determine the appropriateness of the academic achievement test, which consists of 25 items, with the objectives of the "journey to the world of living beings" in the science curriculum, and to ensure its validity, the opinions of two faculty members and two classroom teachers, who are experts in their fields and have worked on biology and science education, were consulted. As a result of the expert opinions, three items were removed from the test. In the pre-application of the academic achievement test, the 22-item test was applied to 48 students studying in the 3rd-grade of a state primary school as a validity and reliability study. After the application, item analysis was performed by calculating the item difficulty and discrimination indices of the data. After calculating the scores the students got from the test, 1 point was given for the correct answers and 0 points for the wrong answers in the test. For item difficulty index, p = (RU + RL) / 2N formula was applied. For item discrimination index, d=(RU-RL)/N formula was applied. (N: 27% of the whole group, RU: The number in the upper group who answered the item correctly, RL: The number in the lower group who answered the item correctly) (Çalık & Ayas, 2003). While evaluating the item discrimination index as a result of the item analysis, the criteria determined by Çalık and Ayas (2003) (Questions with zero or negative item discrimination index should not be included in the test; Questions with an item

discrimination index of 0.40 or higher are very good, do not need to be corrected; Questions with item discrimination index between 0.30-0.40 can be changed or used unchanged in case of necessity; Questions with item discrimination index less than 0.20 should not be used or should be rearranged) were taken into consideration. While evaluating the item difficulty index as a result of the item analysis, the criteria determined by Çalık and Ayas (2003) (Questions with item difficulty index of 0.29 or less: Very difficult; Questions with item difficulty index between 0.30-0.49: Medium difficulty; Questions with item difficulty index between 0.50-0.69: Easy; Questions with an item difficulty index between 0.70-1.00: Very easy) were taken into consideration. Table 3 shows the item analysis results of the academic achievement test consisting of 22 items.

Table 3: Academic achievement test item analysis results (22 items)

Questions	Item difficulty index (Pj)	Item discrimination index (rjx)	Item-Total Correlation Sig. (2-tailed) Value
1	0.87	0.38	0.954
2	0.87	0.38	0.414
3	0.87	0.31	0.360
4	0.89	0.31	0.628
5	0.83	0.31	0.595
6	**0.83**	**0.05**	**0.063***
7	0.72	0.43	0.407
8	0.59	0.81	0.597
9	0.48	0.68	0.241
10	0.85	0.25	0.395
11	0.85	0.44	0.677
12	**0.93**	**0.19**	**0.717**
13	**1.00**	**0.00**	**1.00***
14	0.80	0.25	0.368
15	**0.94**	**0.13**	**0.562**
16	0.85	0.44	0.835
17	0.85	0.31	0.651
18	0.93	0.25	0.927
19	0.87	0.31	0.837
20	0.91	0.25	0.396
21	0.85	0.44	0.703
22	0.78	0.38	0.485
Mean	0.835	0.331	0.675
Kuder-Richardson 20 (KR-20) reliability coefficient: 0.770			

According to the item analysis results, since it was determined that the 6th, 12th, 13th, and 15th questions of the academic achievement test consisting of 22 items, did not have the required item discrimination value, these questions were excluded from the test.

The academic achievement test was finalized with 18 items. Table 4 shows the item analysis results of the academic achievement test consisting of 18 items.

Table 4: Academic achievement test item analysis results (18 items)

	Item difficulty index (Pj)	Item discrimination index (rjx)	Item-Total Correlation Sig. (2-tailed) Value	Kuder-Richardson 20 (KR-20) reliability coefficient
Mean	0.815	0.351	0.675	0.733

As can be seen in Table 4, the KR-20 reliability coefficient of 0.733 shows that the academic achievement test is reliable.

2.3.2. Story Writing Skills Evaluation Scale

The story writing skills evaluation scale was used to determine the change in students' story writing skills. The story writing evaluation scale consists of 9 items with a five-point Likert-type. The ranges are stated as Excellent (5), Complete (4), Good (3), Incomplete (2), Very incomplete (1). The story writing skills evaluation scale was taken from page 184 of the "Traditional-Complementary Assessment and Evaluation Techniques Teacher's Handbook" written by Bahar, Nartgün, Durmuş, and Bıçak (2006). The stories that the experimental group students wrote in accordance with the outcomes at the end of the course during the 4-week implementation process were evaluated according to the "Finding an appropriate title for the text, Integrity in the story, The appropriateness of the description used in the story, Coherence of place, time, person, and events, Eligibility of supporting examples, Order of events according to chronology, Using spelling and punctuation marks, Proper use of Turkish tense and modal suffixes, The originality of the text" criteria of the story writing skills evaluation scale. The opinions of an expert scholar, a science teacher, two classroom teachers, and a Turkish teacher were received to ensure the validity of the assessment tool. The agreement of the opinions of the same experts was checked to determine the reliability of the scale. The correlations between these evaluations were determined by Pearson Correlation Analysis. Table 5 shows Pearson's correlation coefficients, which show the agreement rate between observers regarding the story texts of the students.

Table 5: Pearson's correlation coefficients related to the stories

Finding an appropriate title for the text	r = .94
Integrity in the story	r = .90
The appropriateness of the description used in the story	r= .91
Coherence of place, time, person, and events	r = .92
Eligibility of supporting examples	r = .93
Order of events according to chronology	r = .85
Using spelling and punctuation marks	r = .80
Proper use of Turkish tense and modal suffixes	r = .85
The originality of the text	r = .90

Köklü et al. (2006) stated the ranges in which the correlation coefficient can be found as follows: "If r = 0.00, there is no correlation; r = 0.01-0.29, low correlation; r = 0.30-0.70, moderate correlation; r = 0.71-0.99, high correlation; r = 1.00 perfect correlation." As can be seen in Table 5, the Pearson correlation coefficients obtained as a result of the analysis show that the story writing skill evaluation scale is reliable in basic dimensions.

2.3.3. Student Opinion Form on Storytelling

Opinion forms are a type of data collection tool used to get information about a specific subject, where the researcher conveys the questions prepared by the researcher to the participants and receives their opinions (Yıldırım & Şimşek, 2011). The opinion form consisting of seven questions was prepared by the researcher, taking into account that the students were in the concrete operational period.

1. Have you created a story before?
2. Do you like science lessons being told with stories? Why?
3. Have you been able to establish a relationship between your story and real life? Can you explain with examples?
4. Do you think story writing can improve any of your skills? What are these skills? Why do you think you have improved these skills?
5. What difficulties did you encounter while writing the story? Can you explain? How can these difficulties be solved, what are your suggestions?
6. Would you like to create a story in another lesson? Why?
7. Do you have any suggestions for using storytelling in the Science course? What would you recommend for this method to be more effective?

2.4. Data analysis

Data analysis is presented under the titles of analysis of quantitative data and analysis of qualitative data.

2.4.1. Analysis of quantitative data

The quantitative data obtained from the research were arranged, computerized, and transferred to the SPSS Statistics Software. Whether the experimental and control groups differ statistically before and after the implementation was examined. A t-test for dependent groups is used to determine whether there is a statistically significant difference between the means of two measurements for the same groups. Independent group t-test is used to determine whether there is a statistically significant difference between the means of two measurements for different groups. A hypothesis test was written to determine whether there is a difference between the pre-test and post-test scores of the application within and between groups.

- H0: Experimental Group pre-test = Experimental Group post-test or H0: Experimental Group pre-test= Control Group post-test
- H1: Experimental Group pre-test ≠ Experimental Group post-test or H1: Experimental Group pre-test ≠ Control Group post-test
- H0 hypothesis: there is no statistically significant difference within or between groups.
- H1 hypothesis: there is a statistically significant difference within or between groups.

Whether the pre-test-post-test difference of the groups showed normal distribution was determined by the Kolmogorov-Smirnov test and evaluated according to the 0.05 significance value. According to Can (2017), if $p > 0.05$ in significance tests, there is no significant difference; if $p \leq 0.05$ there is a significant difference. For the academic achievement test and the attitude scale, in which normality assumption was provided in the evaluation of the scores within the group, the t-test for the dependent groups was performed.

The academic achievement test consisting of 18 items was applied to the groups, and the scores obtained from the achievement test were analyzed in the SPSS statistical analysis software. Table 6 shows the findings of the data obtained.

Table 6: Descriptive statistics values of the academic achievement test

	Experimental Group pre-test	Experimental Group post-test	Control Group pre-test	Control Group post-test
Number of Students	31	31	30	30
Mean	15.54	17.08	14.86	15.36
Median	16.00	17.00	16.00	15.50
Standard deviation	1.679	1.017	2.833	2.321
Kurtosis	-.072	-.906	-.829	-.765
Skewness	-1.128	-.168	-.469	-.142

When the normality test conducted before starting the research is examined, the assumptions are tested. According to the results of the analysis, the kurtosis and skewness values between -2 and +2, as seen in Table 6, indicate that the data are distributed normally (İmrol, Saatçioğlu & Demir 2016). This condition reveals that the experimental and control groups are equal to each other in terms of success.

2.4.2. Analysis of qualitative data

On the qualitative aspect of the study, the content analysis was used to reveal the experimental group students' opinions regarding storytelling in teaching activities. Content analysis provides access to concepts and relationships that can be used to explain the data collected (Gökçe, 2006). While stating the students' comments, a code was created for the students. For example, it was expressed as "according to S1." Themes were determined by combining similar codes. The analysis of student views and stories was conducted by experts in the field to ensure the validity and reliability of the qualitative aspect of the research. The consistency of the codes employed by researchers independently was determined by scoring them as "Agreement" or "Disagreement." The codings that the researchers made the same in the student views were accepted as consensus, and different codings were accepted as disagreement. In cases where the researchers conflicted, the coding was done by taking the separate

opinions of different researchers. The reliability of the research was calculated using the formula of Agreement / (Agreement + Disagreement) x 100. To ensure reliability, the agreement between the researcher and the expert should be 90% and above. (Miles & Huberman, 1994). The mean reliability was found to be 90%.

3. Findings

This section presents the analysis results of the academic achievement test and the story writing skills evaluation scale, quantitative data tools, and the student opinion form on storytelling, the qualitative data tools.

3.1. Is there a statistically significant difference in the academic achievement of the experimental and control group students before and after the instructional activities?

3.1.1. Experimental and control group academic achievement pre-test and post-test findings
Since the difference between the academic achievement pre-test scores of the experimental and control groups provided the assumption of normality, independent groups t-test was conducted (Table 7).

Table 7: Independent groups t-test for academic achievement pre-test data

	Groups	N	Mean	Standard deviation	Dd	t	p
Pre-test	Experiment	31	15.54	1.679	46	1.022	.312
	Control	30	14.86	2.833			

Dd: Degree of dependence p: Significance

As can be seen in Table 7, in the study with a study group of 61 participants, in which the effect of storytelling in science teaching on academic achievement test, independent groups t-test was conducted to determine the change between pre-test scores. As a result of the t-test, it was determined that there was no significant difference between the pre-test (mean pre-test = 15,54) and the post-test (mean post-test = 14.86) scores [t (46) = 1.022 p> 0.05].

Since the difference between the academic achievement post-test scores of the experimental and control groups provided the assumption of normality, independent groups t-test was conducted (Table 8).

Table 8: Independent groups t-test for academic achievement post-test data

	Groups	N	Mean	Standard deviation	Dd	t	p
Post-test	Experiment	31	17.08	1.017	46	3.212	.003
	Control	30	15.36	2.321			

Dd: Degree of dependence p: Significance

As can be seen in Table 8, in the study with a study group of 61 participants, in which the effect of storytelling in science teaching on academic achievement test, independent groups t-test was conducted to determine the change between post-test scores. As a result of the t-test, it was determined that there was a significant difference between the pre-test (mean pre-test = 17,08) and the post-test (mean post-test = 15.36) scores [t (46) = 3,212 p<0,05].

Figure 1 shows the graph of the academic achievement pre-test and post-test total scores of the experimental and control group students.

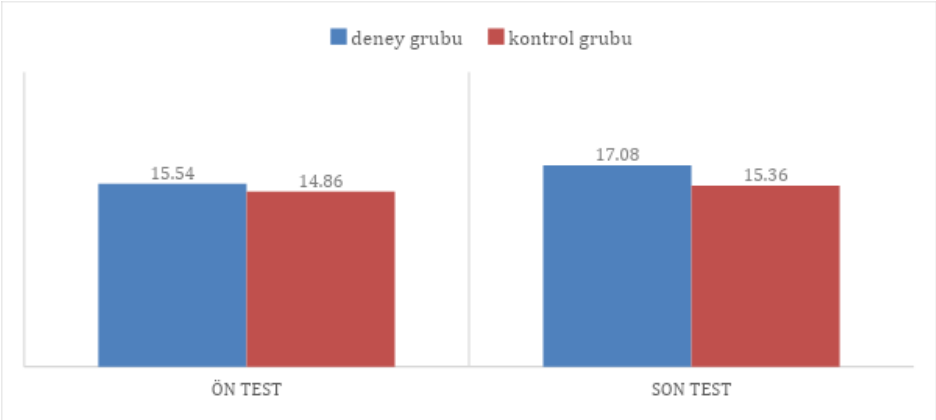


Figure 1: Experimental and control group academic achievement test pre-test and post-test chart
Note. Experimental group, Control group

When the graph is examined, it can be seen that the academic achievement post-test scores of the experimental group students are higher than the pre-test scores, and the academic achievement post-test scores of the control group students are close to the pre-test scores.

3.2 Is there a statistically significant difference in the story writing skills of the experimental group students after the storytelling in teaching activities?

3.2.1. Findings Regarding the Story Writing Skills Evaluation Scale

Table 9 shows the mean scores for a total of four stories written by the experimental group students every week after the application in accordance with the gains of the topics covered.

Table 9: Experimental group Skill scale story averages

Skills	**Story 1**	**Story 2**	**Story 3**	**Story 4**
Finding an appropriate title for the text	3.789	3.684	3.8	4.316
Integrity in the story	3.737	3.684	3.8	3.947
The appropriateness of the description used in the story	3.526	3.474	3.8	4.053
Coherence of place, time, person, and events	3.579	3.737	3.85	4.316
Eligibility of supporting examples	3.684	3.579	4	4.263
Order of events according to chronology	3.737	4.053	3.95	4.316
Using spelling and punctuation marks	3.737	3.789	3.8	4.053
Proper use of Turkish tense and modal suffixes	3.842	4.105	3.95	4.158
The originality of the text	3.947	3.947	4	4.368
Mean	3.730889	3.783556	3.883333	4.198889

As can be seen in Table 9, story 1, story 2, and story 3 mean scores are above 3 "good," and the story 4 mean score is above 4 "Complete." It was observed that the skills progressed towards story 2, story 3, and story 4, respectively, in the categories of "Coherence of place, time, person, and events," "Using spelling and punctuation marks," "The originality of the text," "Finding an appropriate title for the text," "Integrity in the story," "Appropriateness of the description used in the story," and "Eligibility of supporting examples." Figure 2 shows the graph of the skill scale mean scores of story 1, story 2, story 3, and story 4, written by the experimental group students.

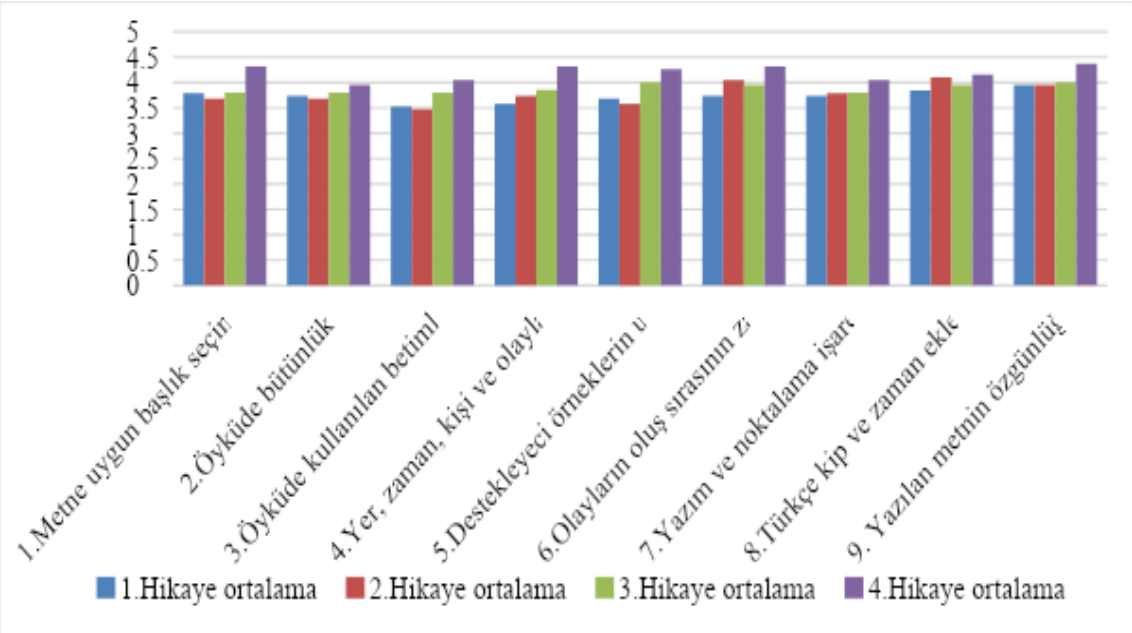


Figure 2: Experimental group story 1, story 2, story 3, and story 4 mean scores

Finding an appropriate title for the text, 2.Integrity in the story, 3. The appropriateness of the description used in the story, 4. Coherence of place, time, person, and events, 5. Eligibility of supporting examples, 6. Order of events according to chronology, 7. Using spelling and punctuation marks, 8. Proper use of Turkish tense and modal suffixes, 9. The originality of the text

Note. 1st story average, 2nd story average, 3rd story average, 4th story average.

Since the story writing skill of the experimental group provides the assumption of normality between the first story and the last story, the dependent group t-Test was conducted (Table 10).

Table 10**:** Dependent group t-Test for experimental group skill scale

Stories	N	Mean	Standard deviation	Dd	t	p
First story	31	3.78395	.783334	17	-3.223	.005
Last story	31	4.17901	.696645			

As can be seen from Table 10, dependent groups t-Test was used to determine the difference between the first story and final story scores in the experimental group, in which the effects of storytelling in science teaching and story writing training on the change in students' story writing skills were examined. As a result of the t-test, it was determined that there was a significant difference between the pre-test (mean pre-test = 3.78) and the post-test (mean post-test = 4.17) scores [t (21) = -1,319 p <0.05].

3.3 What are the experimental group students' opinions about the implementation after the storytelling in teaching activities?

3.3.1. Student Opinions Findings on Storytelling in Teaching Activities

The "Student Opinion Form" regarding storytelling in teaching activities consists of seven questions. Themes were determined according to the answers given to the questions, student expressions were grouped according to themes, and tables were prepared, supported by frequency data. Content analysis was performed on the data obtained from the form, and the findings were interpreted. In the analysis, students were coded with the letter "S," and direct quotations were included.

Table 11 shows the responses of students to the question "Have you created a story before?"

Table 11: Story creation status of students

Have you created a story before?	**Frequency**
Yes	29
No	2
Total	31

As can be seen from Table 11, the students (f = 29) who create a story before are in the majority.
Table 12 shows the responses of students to the question "Did you like the science lessons being told with stories? Why?"

Table 12: Student opinions about storytelling in science course

Theme	**Code**	**Frequency**
Yes	I had fun	8
	It is a different method	6
	I learned new information	6
	I like stories	5
	My dream world has evolved	4
No	I felt like a Turkish lesson	2
Total		31

As can be seen in Table, the majority of the students (f = 29) stated that they liked the science lesson being told with stories. The students stated that they had fun in the lesson (f = 8), that was a different method (f = 6), they learned new information (f = 6), they liked stories (f = 5), and their imaginations developed (f = 4). One of the students (S1) who made these statements expressed her opinion as follows: "*I liked it because science lessons were previously ordinary, but reading and listening to stories changed the lesson a lot.*" On the other hand, two students stated that they do not want stories to be used in science lessons. The student (S30) expressed his opinion as *"No, I did not like it because I felt like a Turkish lesson."*

Table 13 shows the responses of students, who participated in the interview regarding the use of stories, to the question "Do you think that creating stories developed any personal skills? What are these skills?"

Table 13: Skills that developed with story creation

Theme	**Code**	**Frequency**
Mental skills	My imagination developed	13
	It developed my mind	5
	Writing skill	4
	I was able to convey my knowledge	1
Affective skills	I gave up some of my habits	1
	My self-confidence has increased	1
Psychomotor skills	My handwriting has become better	3
	I don't think so	3
Total		31

As can be seen from Table 13, students stated that story-making mostly (f = 24) improved their mental skills. Most of the students stated that their imaginations developed (f = 13), some students stated that it developed their minds (f = 5), their writing skills improved (f = 4), and they could able to convey their knowledge (f = 1). Among the students who made these statements (S3) said: "*Yes, I think so. As we write stories, my evolving skills are self-confidence and gathering my thoughts.*" While (S4) said: "*In short, it improved everything for me. It improved my speaking skills, imagination, story, and so on.*" Under the affective skills theme, one of the students stated that "some of my habits changed" (f = 1), another one stated that "my self-confidence increased" (f = 1). Under the

theme of psychomotor skills, the students stated that their handwriting has improved (f = 3). On the other hand, it was observed that there were students who thought that any of their skills did not change (f = 3).

The students who participated in the interview regarding the use of stories were asked, "What kind of difficulties did you face while creating the story?" Table 14 shows the responses of the students.

Table 14: Difficulties faced while creating a story

Theme	Code	Frequency
Difficulty faced	Story building process	12
	I get tired when I write	3
	I am bored	2
	My handwriting is bad	2
	Character selection	1
	I didn't face any difficulty	11
Total		31

As can be seen in Table 14, most of the students (f = 20) stated that they had difficulties in the process of creating a story. The students mostly stated that they had difficulties in the process of creating stories (f = 12), getting tired while writing (f = 3), getting bored while writing (f = 2), having bad handwriting (f = 2), and choosing characters (f = 1). The student (S4) said: "*I have difficulty writing stories mostly because my handwriting is bad*." Also, some of the students stated that they did not have any difficulty while writing the story (f = 11).

Table 15 shows the responses of students, who participated in the interview about the use of stories, to the question "Do you have any suggestions for overcoming the difficulties you faced while creating a story?"

Table 15: Students' suggestions to overcome the difficulties

Theme	Code	Frequency
Solution suggestion	I should think more	2
	I have to read more	2
	I have to write more	2
	I have to trust myself	1
	I have to clear my mind	1
Total		8

As can be seen in Table 15, students stated their solution suggestions as think more (f = 2), read more (f = 2), write more (f = 2), self-confidence (f = 1), clear the mind (f = 1). The student (S4) said, *"I need to increase my writing studies."*

Table 16 shows the responses of students, who participated in the interview about the use of stories, to the question "Do you want to create a story in other courses?"

Table 16: Students' opinion on creating a story in other courses.

Theme	Code	Frequency
Yes	I like to write stories	7
	It is entertaining	7
	It makes it easier to learn in other courses.	3
	It develops mind/imagination.	3
	It contributes to the correction of spelling.	1
No	It does not fit other classes.	4
	Writing is tiring	4
	Not liking the stories related to other courses	2
Total		31

As can be seen in Table 16, most of the students (f = 21) want to create stories in other courses too. Regarding the use of storytelling in other courses, students stated that they like to write stories (f = 7), find it entertaining (f = 7), think that it facilitates learning in other lessons (f = 3), think that it improves their imagination (f = 3), and think that it improves their writing (f = 1). On the other hand, some students (f = 10) did not want to create stories in other courses. The students stated that the stories were not suitable for other courses (f = 4), writing stories was tiring (f = 4), and they would not like stories from other lessons (f = 2). Student (S2) said, "*No, because I do not want stories in mathematics, life studies, English and Turkish lessons. I don't like stories about them. I just love science now.*"

Table 17 shows the responses of students to the question "Do you have any suggestions for the effective use of storytelling in science courses?"

Table 17: Students' suggestions for the effective use of storytelling

Code	Frequency
Stories should be exhibited	3
More stories could be written	2
Writing stories with everyone's ideas	2
Hidden concepts within the story can be increased	1
Having teachers who are a good storyteller	1
I did like it	1
Total	12

As can be seen in Table 17, for the effective use of storytelling in courses, students suggest that the stories should be exhibited (f = 3), more story should be written (f = 2), stories should be written with everyone's ideas (f = 2), hidden concepts in the stories should be increased (f = 1), and there should be teachers who are good storytellers (f = 1). The student (S5) stated that *"I wish the stories we wrote were exhibited"*.

4. Discussion

As a result of the data analysis regarding the effect of storytelling in teaching activities on the academic achievement of the students, it was concluded that there was a significant difference in favor of the experimental group at the level of $p < 0.05$, which is considered to be the statistical significance level. Based on this result, it can be stated that storytelling in teaching has a positive effect on student achievement. There are studies that examined the effect of the storytelling method on the academic success of students. In Özden's (2012) study to determine the effect of the storytelling method on the achievements and conceptual learning of 5th-grade students, a significant difference was found, in terms of independent groups t-Test, between the experimental group, in which teaching activities based on storytelling method were applied to 5th-grade students, and the control group, who only participated in the activities in daily teaching plans. Arslan's (2014) study examined the effect of the storytelling method on students' academic success in the 7th-grade Social Studies course and found that the storytelling method had improved the academic success of students. In Unver's (2015) study, which was examined the effect of storytelling technique on the discovery step of the learning cycle teaching model in learning the concepts of the digestive system by 5th-grade students, since the success scores of the experimental group students, where the storytelling technique was used in teaching, were higher than the success scores of the students in the control group, it was determined that the storytelling technique had a positive effect on success. In the study conducted by Doğan (2016), the effect of storytelling technique on teaching concepts in science course was examined, and between the posttest scores of the students' "Academic Achievement Test," a significant difference was determined in favor of the experimental group. It was concluded that the applied teaching method did not have a significant effect on the attitude towards science and technology courses. Köse and Yıldırım (2019) conducted a study to determine the effect of teaching the circulatory system to 6th-grade students in the science course with story-supported in-class activities on academic achievement and permanence, and they determined that the experimental group post-test success scores were higher than the control group and there was a significant difference between

them. Considering the difference in the experimental and control groups, it was concluded that the story-supported classroom activities contributed positively to the students' success in the circulatory system unit and to ensure permanence learning. It has been reported that storytelling in teaching activities in science will make the lessons more productive (Banister & Ryan, 2001; Fensham, 2001). Considering the results of the studies in the literature, the fact that the teaching with the stories caused a significant difference in favor of the experimental group, between the academic achievement posttest scores of the experimental and control groups, supports the result of the study.

The experimental group students, in which the teaching activities with stories were applied, were asked to write a story about the subject every week after the story training was given. At the end of the seven-week process, a significant difference was found in the analysis results to determine the difference in writing skill between the first story and the last story ($p < 0.05$). This finding suggests that storytelling in teaching activities contributes positively to writing skills. The literature supports this finding. In the study of Kayahan (2010), which examined the effect of the storytelling method on creativity in visual arts education, it was determined that the experimental group students produced original ideas with the storytelling method, they look for different names for their works, and the storytelling method contributed positively to the creativity of the students. In the study conducted by Takımcıgil and Özcan (2014), to determine the effect of 4th-grade students' writing motivation on their story writing skills, students were asked to write stories and evaluated using the story writing rubric. As a result of the study, it was determined that female students' motivation to write was higher than male students' motivation, and a significant correlation was found between writing motivation and story writing skill. Bulut Gül (2018) examined the relationship between the story writing skills of primary school 4th-grade students and their problem-posing skills; It was determined that there was a moderate, positive, and significant relationship between the students' problem-posing scores and their free story writing, story writing from visuals, story writing from story map, and story completion scores.

After the storytelling in teaching activities for seven-week, positive findings were obtained in the experimental group students' opinions about the storytelling in teaching activities, such as they had fun in the lessons, their mental skills improved, they wanted to create stories in other lessons, they wanted to exhibit their stories, they wanted to have teachers who are good storytellers, and they had difficulties in the story-making process in general; as a solution suggestion, positive findings were obtained stating that more reading, writing, and thinking is required. When the studies in the literature are examined, the findings obtained from the study are supported. In the study conducted by Kuş (2014), the effect of presenting sections from the life stories of scientists who have contributed to the science of biology on students' attitudes towards biology lessons was examined. Also, data were collected from the experimental group students with a structured interview questionnaire to determine the students' views about the use of this method in lessons. As a result of the data analysis, it was concluded that such practices relaxed the students towards the lessons, save the lesson from ordinariness, and made it more enjoyable. The study of Gönül (2016) aimed to determine students' interests and attitudes towards the lessons by using stories and images in the 4th-grade social studies course. At the end of the application, data were collected with a semi-structured interview form designed by the researcher to determine the students' opinions about the course. In line with the findings, it was concluded that the use of stories and images attracted the attention of the students, and the students gained empathy skills. This situation led to the interpretation that students were excitedly waiting for the social studies course. The study by Gölcük (2017), examined the effects of science education supported by scientific stories on the creativity and affective characteristics of middle school students and the effect of scientific stories on student views; it was concluded that science education supported by scientific stories increases students' interest, curiosity and willingness towards the course, and this method has a structure that is sensitive to the events around it, makes abstract concepts understandable and helps the permanent learning. Similar studies in the literature have shown that storytelling in teaching activities is seen by students as extraordinary, and since it makes the lesson more enjoyable and saves the lesson from ordinariness, they want it to be used more frequently in lessons. Although storytelling in teaching is often used in primary education, it can also be used for students of different levels (Kee & McGovan, 1998; Banister& Ryan, 2001; Pilling, Holman & Waddington, 2001). Since storytelling stimulates emotions in students, science can become more meaningful to them (Banister & Ryan, 2001).

Acknowledgments

This article was produced from the master dissertation of Sema Okur, conducted under the supervision of Tuba Demirci.

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