

The Effect of Using Scientific Stories on Teaching Science and on the Academic Achievement of the Students

Bilimsel Hikayelerin Fen Eğitiminde Kullanımı ve Öğrencilerin Akademik Başarısına Etkisi

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Abstract: Nowadays, researchers in education sciences investigate learning environment responsible for students' learnings. One of the most important aims of contemporary teaching methods is to attain desired level of learning environments. Main purpose of this study is to investigate the effect of scientific narration method on the academic success of students. In this respect, a study based on quasi-experimental design with pretest – posttest control groups was utilized. Data collection tools consisted of an achievement test with 24 short answer questions and students recordings on their journals during the process. Document analysis and content analysis were used to analyze data. In conclusion, the findings of the study revealed that scientific stories created a significant difference on academic achievement in favor of the control group.

Keywords: Physics education, science education, scientific narration, academic achievement.

Öz: Bugünlerde çoğu araştırmacı öğrencilerin öğrenmelerinden sorumlu olan sınıf ortamı üzerinde durmaktadır. Çağdaş eğitimin en önemli konusu öğrenme ortamını istenilen düzeye çıkarmaktır. Bu bağlamda bu çalışmanın da ana konusu bilimsel hikayelerle yapılan bir eğitim yönteminin öğrencilerin akademik başarılarına etkisini incelemektir. Bu amaçla çalışma da ön test-son test gruplu yarı deneysel desen kullanılmıştır. Çalışma 7. Sınıf öğrencilerinden rastgele belirlenmiş bir deney ve bir kontrol grubu üzerinde gerçekleştirilmiştir. Veri toplama araçları olarak kısa cevap gerektiren 24 soruluk başarı testi ve katılımcıların araştırma süreci boyunca görüşlerini kaydettikleri jurnaller kullanılmıştır. Elde edilen bulgular daha sonra doküman ve içerik analizi kullanılarak incelenmiştir. Çalışmada elde edilen bulgulardan bilimsel hikayelerin kullanıldığı deney grubundaki öğrencilerin lehine olmak üzere, akademik başarılarının kontrol grubundaki öğrencilere göre istatistiksel olarak anlamlı bir farklılık gösterdiği sonucuna ulaşılmıştır.

Anahtar Kelimeler: Fizik eğitimi, fen eğitimi, bilimsel öyküler, akademik başarı.

INTRODUCTION

Constructivist approach, which brought a new perspective to the education system, emphasizes on classroom climate where students are responsible from their own learning. Thus, all education programs developed after a certain date support learning environments where students actively participate training and education process. In rapidly emerging today's world, the importance of science and science education cannot be denied. Considering the worldwide influence of the communities dominating science and technology, the importance of science education stands out. Allowing the concepts to be meaningfully learned and internalized, instead of encouraging students to learn by heart can perform an effective science education. All communities, including the developed countries especially, continuously work for promoting science and technology education, as well as improving its quality (Maskan and Maskan, 2007).

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In this context, constructivist approach comes to the forefront. This approach, which assumes that students interpret and internalize knowledge based on their pre-knowledge, represents a student centered learning process where teachers guide students and students get more responsibility on learning process (Küçükylmaz, 2003). Constructivist approach requires the utilization of new methods while teaching. It is crucial to use different methods and techniques in order to obtain aimed learning from educational activities (Obut, 2005; Küçükahmet, 2006). Since it is not expected from a teaching method to be productive for all courses and for all students, teacher should select the appropriate one amongst different teaching methods and techniques, depending on the learning needs of the students and according to the structure of the topic that he/she would explain (Küçükahmet, 2006).

One of these different methods is a scientific story. It was used for the purposes of enhancing scientific literacy of the students (Richie et al., 2011); identifying its influence on students' ideas about the scientists (Erten et al., 2013; Sharkawy, 2012); developing scientific stories using visualizations (Ma et al., 2012); teaching earth sciences (Phillips, 2012). People have preferred to reflect their feelings, thoughts, dreams and wishes via stories in which, they had given the messages they wanted to give (Şen Gümüş, 2009). Story, is a product of written literature, which briefly describes a situation. In other words, these are works, which narrate events that might occur or that might have occurred (Kavcar, 2002). Scientific stories, unlike other narrations, are intended for a specific purpose and prepare a medium for hidden learning as well as providing open messages for students. Moreover, scientific narration offers story areas where science concepts are personalized or everyday issues are solved using scientific notions. Problem solving by traditional heroes like Keloglan, Nasreddin Hodja or by cartoon heroes of modern era, in terms of using scientific notions will get the attention of students, as well as being effective for them to internalize the concepts. Scientific narration, which is an interdisciplinary and problem based method, allow the students to learn via discovery, thought and action (Bertiz, 2005).

Scientific stories can be classified under four titles (Milne, 1998):

1. Heroic science stories: Heroic science stories are the ones, in which life of the people who contributed to the development of science have been narrated.
2. Discovery science stories: These stories narrate that some scientific findings have been found by accident.
3. Declarative science stories: This type of stories emphasizes that science and scientific knowledge is a discipline that is open to the research and investigation for everyone.
4. Politically correct science stories: These stories examine the development of science in different communities by evaluating the interaction of different cultures.

Scientific narration method can be combined with multiple intelligence theory, which is another point increasing its importance. Traditional understanding associates courses like mathematics and science with logical-mathematical intelligence. But narration method addresses to linguistic and intra-personal intelligences as well.

Six elements of a story, developed by Baumann and Bergeron (1993), should be considered while editing the stories (Şen-Gümüş, 2009).

These are;

1. Who?
2. Where?
3. When?
4. What is the problem?
5. What happened?
6. What was the solution?

In this context, edited stories should be prepared in line with the six steps mentioned above. Scientific narration is a method that has recently took place in the literature. Thus, there are limited studies about this subject. But the studies tend to increase with the increasing interest towards this method. Various studies have been conducted with this method.

For example Milne (1998), in his study, classified scientific stories and emphasized the importance of them for the science education provided at school. According to Milne (1998), some people believe that science is a set of events which can be offered with a simple and unornamented language. This feeds the belief that science has some stories. In fact, stories are crucial while transmitting science. It can be used to get the attention of the students.

Milne, in a study of course books, has identified four different types scientific stories, namely heroic science stories, discovery science stories, declarative science stories and politically correct science stories. Each of these types support a specific set of assumptions about science. These assumptions are indirectly offered under the roof of the story as the realities of the science.

Tao (2002), investigated in his study, the reaction of year 7 age group students towards scientific stories and either they can make inferences regarding the nature of science cited in the stories or not. At the end of the study, it has been found that the majority of the students have developed a perspective based on their previous experiences obtained from their random discoveries and they have accepted scientific theories as absolute truths that represent the reality. In addition, it has been seen that scientific stories have considerably impressed students and the co-operative learning given in the stories has changed their opinions about sharing their thoughts and the nature of the science.

Another study about the effect of scientific narration to the academic success has been conducted by Dincel (2005). During this study, he asked the students to complete unfinished stories. Then, the stories, completed by the students, have been evaluated. At the final stage of the study, researcher has finished the story and finalized the process. At the end of the study, it has been found that narration method did not create a significant difference on the academic success of the students.

In another study, Şen-Gümüş (2009) discovered scientist image in the mind of the students using narration method. At the end of the study, it has been found that the person imagined as a scientist was male, old, bespectacled, wearing a white apron. Şen-Gümüş aimed to change this image using the scientific stories that they have prepared.

Coşkun and friends (2012) conducted a study to measure the effect of scientific narration to the academic success of students. Within the content of the study, an experimental design has been conducted with test and control groups. The application has lasted for five weeks and at the end of the study it has been found that scientific narration method created a significant difference in favor of the test group. The effect of the gender on the academic success has also been investigated within the content of the study. Researchers concluded that scientific narration method has not created a significant difference between genders.

Conducted studies show that scientific narration is an effective method on learning in terms of attitude and academic achievement. In addition it has been found that the method does not create a significant difference on academic achievement in terms of gender.

For the reasons stated above, courses prepared with scientific stories will positively affect academic success of the students; will help them to look at some physics topics, found to be complicated, more positively (refraction, light speed, visible and invisible rays). In addition, teachers will gain a new perspective; it will positively affect classroom environment and climate. Similarly, it will enlighten the way for future researches.

METHOD

Pattern of the Study

Main purpose of this study is to investigate the effect of the utilization of scientific stories during the topics “Absorption of Light - Is white light really white?”, “Refraction of Light and Lenses” under “Light” chapter of 7th grade science course curriculum.

This study is an quasi-experimental design with pretest – posttest control groups. It has been conducted with two 7th grade classes studying at elementary school; the class to whom

scientific stories has been presented was named as story group whereas the other group lacking this application was named as control group.

Number of students and gender distribution of test and control groups are displayed in Table 1.

Table 1. *Distribution of Test and Control Groups According to Gender*

Group	Test		Control	
	N	%	N	%
Female	12	46	13	49
Male	15	54	14	51
Total	27	100	27	100

N: Number of students, %: percentage of the students within the group.

Participants of the study were based on two criteria: 1) They have to be enrolled in 7th grade at a public school; 2) Reachability of the participants. In addition, student body of the school is assumed to be similar socioeconomic and academic background. Since selected school is established in a town that takes immigration, it has been assumed that students have different learning habits. After the target school that has such 7th grade students, two classes have been randomly selected as test and control groups. Required permissions to conduct the study at the school have been obtained.

Prior to the study, a pretest has been applied to both test and control groups. The courses has been conducted according to the curriculum based on 5E model in both test and control groups. In this context, eight curriculums have been prepared following the same sequencing of the topics of the textbook. Test group has been exposed to the related story in addition to the activities. The researchers explained the stories first, and then students were asked to review the story. Following the review of the students, they and the researcher have explained scientific notions mentioned in the story using discovery technique. In addition, four students from the test group (10% of the group) were asked to write “story journals”. Students who will write story journals were randomly selected after the pretest. Dependent variable of the study is the academic success scores of the students that they obtained from science course. Independent variable of the study is the scientific narrative method, applied during study.

Before starting the study, a pretest has been applied to both test and control groups. In both test and control groups, the courses has been conducted according to the curriculum based on 5E model. In this context, eight curriculums have been prepared following the same sequencing of the topics from the course book. Test group has taken the related story in addition to the activities from the course book. The researcher has explained the stories and then students were asked to review the story. Following the review of the students, students and the researcher have revealed scientific notions mentioned in the story using discovery technique. In addition, 4 students from the test group (10% of the group) were asked to write “story journals”. Students who will write story journals were randomly selected after the pretest. Dependent variable of the study is the academic success scores of the students that they obtained from science course. Independent variable of the study is the scientific narrative method, applied during study.

The process about the pattern of the research is shown in Table 2.

Table 2. *Pattern of the Research*

	Pretest		Post-test
G _T	Pre ₁	5E + X _{Scientific stories}	Post ₁
G _C	Pre ₂	5E	Post ₂

*G_T Test Group, G_C Control Group, Pre₁ test group pretest results, Post₁ test group post-test results, Pre₂ control group pretest results, Post₂ control group post-test results, X experimental proses applied to the members of test group.

5E model is a course development technique where the lecture has been conducted in five stages. The course has been divided into five parts, namely engage, explore, explain, elaborate and evaluate (Baumann and Bergeron, 1993).

1. Engage

The purpose of this stage is to canalize the attention of the student to the lecture. In addition, past knowledge and presence level of the students should be considered as well.

2. Explore

At this stage, students are expected to explore learning materials by themselves, without direct orientation of the teacher using the techniques such as cooperative learning, brain storming. Students create various ideas and perspectives freely. At this stage, where the activities of the students are at maximum level, teacher should act as a good observer and guide the students.

3. Explain

At this stage, students are expected to describe the knowledge that they obtained during exploration stage with their own phrases. This stage may be more difficult for the students, compared to the other stages. Thus, the counseling of the teacher is mostly needed.

4. Elaborate

During the elaboration, students test the concepts, skills or problem solving approaches that they have recently learned, in new situations. Conceptual misunderstandings can be corrected at this stage. Also, learning new concepts, synthesis past knowledge with new one occurs at this stage as well. Teacher, guide the students by offering new learning environments.

5. Evaluate

At this stage, the work done during the previous stages and the knowledge obtained have been finalized. Evaluation, which was effective in all stages, looms large. Alternative assessment methods are used at this stage.

Application Material

Scientific Stories: Eight scientific stories, used during the study, have been prepared by the researchers (Appendix – 1). Specialized academicians and pedagogues have reviewed these stories in order to check their scientific dimension and their appropriateness to the level of the students. During this process we first met with two academician pedagogues, who are specialized on educational sciences, in order to check the appropriateness of the stories to the development features of the students. Then we met with a specialized science teacher to review scientific dimension of the stories. Stories were redesigned according to the comments of the specialists.

Stories were prepared considering “six elements of a story” developed by Baumann and Bergeron (1993). In addition to these steps, students were asked to record scientific data cited within the stories while reviewing them.

Another factor considered while preparing the stories is that the story includes knowledge about various topics. Some of the scientific notions cited in the story were related with the knowledge acquired from previous courses. Thus, newly acquired knowledge can be organized using previous knowledge.

Another purpose of narration process is the association of science notions with the heroes of everyday life or with the heroes from the childhood of the students. Thus, characters cited in the stories would both contribute to the cultural progress of the students and show them that science is a part of daily life.

Characters from child stories, such as Nasrettin Hodja and Keloğlan, solving their problems using science or personally being a part of science, are expected to create a positive effect on the learning process. Moreover, including stories from world literature, such as the

Three Musketeers, within the science course will be effective both on the recognition of these kind of stories, and the success of science course.

The 8 studies were edited considering the sequencing of topics covered in the elementary school curriculum (Stories are presented on Appendix – 1). Stories were presented to the students at the deepening stage of the course. First, the stories were read with the students, and then they had time to analyze the story. Then, students were expected to identify the notions via discovery. Moreover, while narrating the stories, the researcher has cooperated with the science teacher of the application school and consulted his views during the process.

Data Collecting Tool

The Light Achievement Test: The light achievement test, applied to measure pre and post knowledge of the students about the chapter, was developed by Ünal-Çoban (2009). It contains 24 open-ended questions requiring short answers. This test was chosen to measure students' understandings of concepts in Light chapter. This test could be used to assess academic achievement of the Light concept.

In order to test the validity of the test, split-half methods was utilized by dividing it into two parts and evaluated the relationship between them using Pearson Correlation Coefficient. Internal validity coefficient was found to be .892. Afterwards, factor analysis has been performed and it has been found that reliability range varied between .50 and .70. Thus, the achievement test used within the research is a valid and reliable one for measuring target behavior of Light chapter. Before the application, required permissions have taken from authorities. Pretest and posttest applications has been conducted before starting the chapter, for both test and control groups.

Table 3. *Questions and Their Distribution According to Topics*

Questions	Main Title	Sub Title
1, 2, 3, 7	Absorption of light and luminous energy	Light is linear Light-heat transformation
4, 5, 6, 11, 12, 13	Sun light Objects looking in different colors	Characteristics of sun light Main colors - Intermediate colors
8,9	Seen and unseen rays	Spectra of light and unseen rays
10, 14, 15, 16	Refraction of light	Less intense - intensive environment Speed of light in different environment
17, 18, 19, 20, 21, 22, 23, 24	Lenses	Concave lens Convex lens

Table 3 shows that achievement test contains 4 main topics and sub-topics covered in the chapter. Moreover the distribution of the questions according to topics is in line with the purpose of the study.

Story Journals

Story journals were assigned to 4 randomly selected students from test group at the first week of the application. Selected students recorded their thoughts to these journals every week, after the instruction of the stories. In order to assure the objectivity, students were asked to keep the journals anonymously. Moreover, the journals weren't written during courses, students were left free at this stage. Students were also informed that they should not exceed one page per story

while commenting but they don't have any limitation for the content of the comments, they are free to write whatever they think.

This application was not applied to the students from control group. The aim of this application is to determine positive and negative opinions of the students about the method and see the changes on their opinion across weeks. Journals have been picked up at the last week of the application, after final tests.

Application Process

Application process of the study has taken place for 6 weeks, in an elementary school, during 2012 spring terms. First, two of the four existing 7th grade have been selected via drawing as test and control groups. Same teacher for both groups has performed the instructions. Thus, the bias that may occur between classes due to the teacher has been eliminated.

The researcher was present during course instructions in order to prevent any problems that might occur and closely followed the process. Courses have been instructed in line with daily plans.

Light achievement test was applied to both test and control groups, at the first week of the study, as the pretest. Test group has been informed about scientific stories before starting the instruction of the topics. In this context, a story prepared by Coşkun and friends (2012) has been used for "Electricity in our life" chapter. In addition, during the first week of the application, story journals were assigned to students selected via drawing. Then, scientific stories have been narrated to test group at the deepening stage of the topics, in line with course curriculum. Each week 2 stories were analyzed, completing analysis of all eight stories for 4 weeks.

Control group was instructed according to the curriculum and scientific stories were not narrated at the deepening stage. Posttest has been applied to both test and control groups at 6th week and application phase of the study have been completed. Moreover, story journals have been picked up at the last week of the study. Collected data has been analyzed using SPSS 17.00 program. Steps of the study are shown in Table 4.

Table 4. *Weekly Application Steps*

Week	Name of the Story	Topic
1	Pretest	
2	Into the Light Electron boy And The Vizier	Linear movement of light Absorption of light
3	Toast island The Three Musketeers	Utilization areas of sunlight Main and intermediate colors
4	Hodja Nasrettin and the Yoghurt Mafia 4 Little Lights	Seen and unseen rays The movement of light in different environments
5	Burn Rome Burn Lord of the Senses	Concave lens Convex lens
6	Posttest	

Short description of the stories

Into the Light: This study explains that the light is moving linearly. For this context, two countries have been formed (Volta country and Light country). Elements of a circuit, from the "Electricity in Our Life" chapter are also included in the story (Volta battery and light bulb)

Electronboy and the Vizier: This study is about the behavior of the light against different colors. It emphasizes that dark colors absorb light whereas light colors reflect it. The story is based on a tale of Keloglan.

Toast Island: This study says that light is a type of energy and it can be converted to other energy forms. Among these transformations, conversion of light to the heat energy and the utilization of the heat in everyday life were underlined. Solar ovens and clean energy sources are discussed.

The Three Musketeers: In this study, 3 main and 3 intermediate colors of the light have been explained by relating them to three musketeers. In addition, there are concepts from the “Electricity in our Life” chapters

Hodja Nasrettin and the Yoghurt Mafia: This story tells the students about visible and invisible rays. For this purpose, a story, with Hodja Nasrettin at the core, has been formed.

Four Little Lights: This story is about the refraction of the light. The study explains the movement and speed of light in less dense and denser mediums. Moreover, the angle of refraction, border angle and the angle of reflection are introduced.

Burn Rome Burn: This story is based on convex lenses and their utilization areas. The fact that convex lenses concentrate sunlight is forming the skeleton of the story. The story is based on the scientific fiction of a historic event.

Lord of the Senses: The last story, Lord of the senses, is about concave lenses. It shows that concave lenses distribute the light and can be effectively used for the correction of the vision. Nervous system has also been mentioned.

Data Analysis

Pretest – Posttest Analysis

The achievement test used during the study has been applied to the students twice, first at the beginning, second at the end of the process. The correlation between pretests of test and control groups has been determined using independent sample t-test. Similarly, the correlation between posttests of test and control groups has also been determined using independent sample t-test. The study has been started following the confirmation that there are no significant differences among pre-test results using t-test. Post-test results were also evaluated similarly and the study has been finalized.

Analysis of Story Journals

Journals recorded by four students during the application have been picked up and analyzed at the end of the process. A content analysis has been conducted. Three main themes have been formed during analysis, which are positive opinions, negative opinions and hesitant. Table 5 shows keywords while determining the themes.

Table 5. *Statements Used to Arrange the Themes*

Positive opinion statements	Negative opinion statements	Hesitation statements
I loved it	Boring	Lack of net expression
I liked it	Long	Only narration of the
Pretty	Not educational	storyline
It was fun	Time consuming	Only narration of the
Educational	Divertive	process
I enjoyed	Not instructional	
Very nice	Not realistic	
Amusing		
Instructive		
Informative		
Scientific		
Super		

Opinions recorded to the journals have been classified within the three main themes. These themes have been identified during the evaluation of students' journals and grouped by the researcher. These views are in line with the concepts included in the literature. A total of 32 opinions, recorded by four students, during four weeks about 8 stories have been examined.

Analyses of the Stories

The 8 stories have been evaluated and approved by specialized pedagogues and scholars in order to see their suitability for the selected age group and selected topics. Moreover, the stories used in the study are in line with the story writing technique determined by Baumann and Bergeron (1993). Toast Island, which is one of the stories used in the study, is evaluated as below:

Toast Island

1. Who?

Heroes of the story are Captain Pilot Nevercrash and Hostess Hope. Passengers of the plane and science teachers are side characters.

2. Where?

Scene of the accident is toast island, 450 km far away from Volta country

3. When?

The story covers a period of 5 days, starting with the opening of the airport.

4. What is the problem?

The problem is cooking the fishes fished by the hungry passengers stuck at the island

5. What happened?

The necessity of cooking the fishes for hungry passengers with the help of a science teacher

6. What is the solution?

The solution of the problem is cooking the fishes using the refraction and reflection of the light.

The theme of the story is light is a form of energy and it can be used following reflection-refraction laws.

FINDINGS

This study has been conducted to investigate the effect of scientific narration method on the academic success of students. Findings of the study are summarized below:

Before the start of the application, an achievement test has been applied to both groups' students as the pretest, to assure the validity and reliability of the study. This allowed seeing if there were a difference between groups in terms of academic success, which may affect the experiment. The researcher was present during the application of the test, intervened to problems that students encountered during the test, thus the amount of incidental errors has been kept in minimum.

In addition, there were no significant differences between pre-test results of the two groups, so they were found to be suitable for the study. Since the data obtained showed normal distribution, pretest results have been evaluated using t-test. The results are displayed in the table below (Table 6).

Table 6. *T-test Results of Pretest Scores According to Groups*

Group	N	M	SD	t	p
Test	27	22.33	12.872	.485	.631
Control	27	24.22	11.587		

* Significant level $p < 0,05$

Data was analyzed within 95% confidence interval (5% error margin). In order to be able to start the application there should be no significant difference between groups, thus p

value should be greater than 0.05. Figures from Table 6 show that there was no significant difference between groups before the application. This result shows that academic success levels of the groups were similar at the starting point.

At the end of the application, an achievement test has been applied to both groups' students as the posttest. The researcher was present during the test and made necessary explanations to the students.

Since the data obtained showed normal distribution, it has been evaluated using T-Test. The results are displayed in Table.7 below.

Table 7. *T-Test Results of Posttest Scores According to Groups*

Group	N	M	SD	t	p
Test	27	70.19	11.942	5.453	.000
Control	27	54.70	9.813		

* Significant level $p < 0,05$

Data was analyzed within 95% confidence interval. The fact that p value is smaller than 0.05 indicates that there is significant difference between groups after the application. Pretest and posttest mean scores of the groups are given in Figure.1.

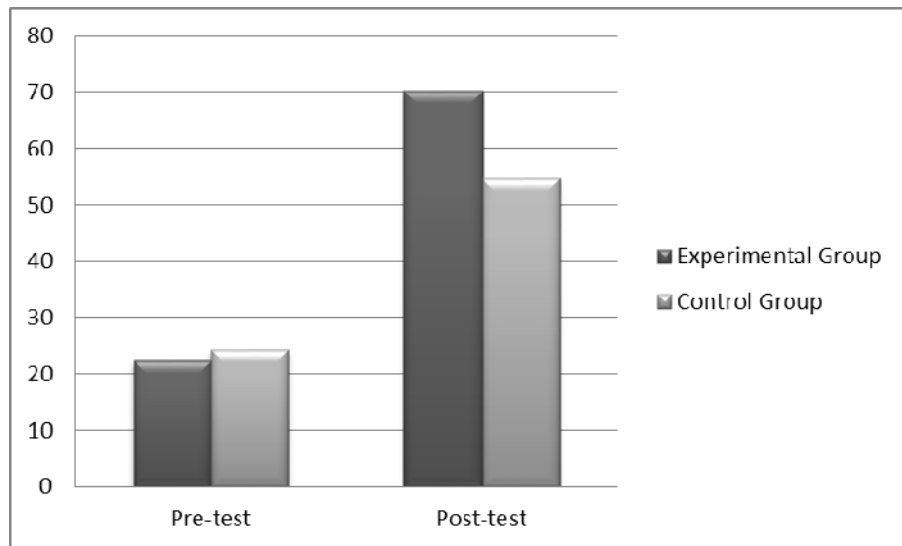


Figure 1. *Mean scores of Test and Control groups*

The figures from Figure 1 show that mean test scores of the groups were similar before the application. But following the application there is a significant difference between mean scores.

Monitoring the change on the opinions of the students during the process was another research issue. For this, four students from the test group were selected via drawing and they were asked to record their opinions about narration method to the journal, each week following the narration of the story. Story journals were picked up at the end of the study and the content was analyzed.

In this context, positive and negative opinions of the students and their level of hesitance were considered. Collected data has been summarized and organized as shown in Table 8.

Table 8. Evaluation of Journals From the Perspective of the Students

	1 st Student			2 nd Student			3 rd Student			4 th Student		
	Positive	Negative	Hesitant	Positive	Negative	Hesitant	Positive	Negative	Hesitant	Positive	Negative	Hesitant
1 st Week	X					X	X					X
2 nd Week	X					X	X		X			
3 rd Week	X			X				X		X		
4 th Week	X			X					X	X		

While evaluating students' opinions, the reasons behind positive and negative views have also been examined. Positive opinions were grouped as "benefits from the educational dimensions of the method" and "benefits from increasing students' motivation towards the course". A similar categorization has been performed for negative opinions as well.

Regarding positive students' opinions during the first week of the study, opinions were found to be concentrated on the fun side of the methodology. Second week, students' opinions were mentioning educational dimension and motivational aspects of the methodology. Third week, the methodology has been found to be positive due to personal curiosity of the students whereas during the fourth week all these three characteristics gained significant importance.

The evaluation of negative opinions showed that students with negative views had not found this methodology to be educational. Negative opinions of the third week were due to the lack of motivation. No negative view has been mentioned during last week.

Highlights from the journal of the students, showing positive and negative opinions of the students can be found below:

Figure 2. 1st Student, 1st week journal

"I think this was a very good story. I believe that all topics of science course are fun. This is a very good method"

1st week evaluation of the first student showed that the student had already liked Science and Technology course and enjoyed the method (Figure 2).

Figure 3. 2nd Student, 4th week journal

"This is the story that I liked most, because this story has both funny and scientific sides, meaning that it is both funny and educational"

Figure 3 shows 4th week journal of second student. The evaluation of the journal shows that the student highlighted the most important characteristics of the methodology, being

amusing and educational. Moreover, another point worth mentioning is that the student is aware of the scientific dimension of the methodology.

Ben bu yöntemi sevmeyim.
Bence test çözmeyle bilim ben
sözlemlerle değilim. Ben onlara göre

Figure 4. 3rd Student, 2nd week journal

"I didn't like this method. I think we should solve test questions, I'm not a linguistic student, this is for them."

2nd week journal of the third student shown in figure 4 contains negative opinions. Student thought that the method is waste of time. He believed that solving tests is more appropriate than spending time to the methodology. Moreover, he stated that this kind of work hasn't been addressing him, it was more appropriate for the students learning with linguistic symbols.

Bu günkü hikayemiz çok güzeldi.
Hocamızın yaptığı hikaye çok
garip bu kahramanı nerden
bulduysa çok güzeldi. Hikaye
de elektrik ve ışığı anlatıyor
du hiçbirsey anlamayan ben
böyle olunca anlamam süper.

Figure 5. 4th Student, 1st week journal

"Today's story was very good. The story narrated by our teacher was weird, wherever he found the hero, he was very good. The story was about electricity and light. Me, who usually doesn't understand anything, understood all when explained in this way. Superb"

1st week journal of forth student (figure 5) indicates that the methodology was quite effective on creating a positive perspective towards science. In his journal, the student stated that actually he doesn't understand science but he learned more easily thanks to this methodology.

Hikayemiz çok güzeldi.
Hocama gitti hep böyle
devam etseydi ama siz
devam etmiyordunuz missin
buna çok üzülüm inşallah
devam edersiniz.

Figure 6. 4th Student, 4th week journal

"Our story was very nice, I liked it. I wish we continue like this but you would not continue. I am deeply sorry for it, I wish you continue."

4th week journal of forth students (Figure 6) contains parallel opinions with the previous journal part. The opinion of the student who did not believe that he would be successful on science course has been changed during following weeks and he became open to learning. Moreover, his wishes about the continuation of the method worth mentioning.

Regarding the notes of the students, it has been observed that the notes are changing within weeks. Although there were students' reactions towards the methodology at the beginning, this has been changed in time. It worth mentioning that at the end of the application, students asked to continue to this method, apply it to the other science topics and even to apply it to all courses.

CONCLUSION and DISCUSSION

Purpose of this study was set as investigating the effect of science education with scientific stories on the learning of the students. Before starting the application in the mentioned direction, a pretest has been applied to both groups and the results were analyzed in order to observe if there was a difference between groups. t-test results have shown that there was no significant difference between groups in terms of academic success.

The analyses performed following the application are based on the posttest results of test and control groups' students. t-test findings of the posttests show that there is a significant difference between groups ($p < 0.05$).

Since scientific studies created curiosity and interest during the course, the success has been occurred in favor of test group. Regarding the literature, this result is in line with the findings of the studies conducted by Coşkun and friends (2012) and Yeşilyurt (2004), which revealed that narration method, was positively affecting learning. The researchers mentioned above stated that science instruction based on scientific stories created significant difference on the learning of science, in different stages of education.

On the other hand, the results of the study differ from the study of Dincel (2005). During his study, the researcher asked the students to complete unfinished stories but the desired level of success could not be reached. Unlike this one, the main reason of achieving a significant difference in our study is the fact that students were eager and curious to find out hidden notions on a completed story, as well as the necessity of actively using their imagination during the analysis process, like solving a puzzle. Thus, unlike the study of Dincel (2005) the students adopted the method. Moreover, the method utilized in Dincer's (2005) study is used for the grip level behaviors whereas the method used in our study is for analyzing the level behaviors. This creates a difference from the study of Dincel (2005) in terms of being a higher level of behavior.

Reviewing the reasons of having a significant difference in favor of the test group, it has been found that test group's students were eager towards the course. In addition, another factor affecting learning was that student could easily visualize invisible concepts such as the movement, refraction and speed of light, which were difficult to understand. Moreover, it has been observed that the curiosity level of the students was always high during the course. During the application, some students started to write their own stories and made some suggestions for the application.

Regarding the control group where the course has been instructed in the traditional way, without any novelty, it has been observed that students found the lesson lasting long. Moreover, they were less eager and curious compared to the test group. This fact revealed one of the advantages of narration method mentioned before.

Another question of the study is about the change on the students' opinions during the process. At this stage, a content analysis has been performed using the journals recorded by students. Findings have been evaluated under three main themes (positive, negative, and hesitant). Study results have been evaluated according to weeks. Findings showed that at the beginning, 50% of the students were cautious towards the method, whereas 25% declared positive and the other 25% declared negative opinions. Positive opinions were based on the method being fun and being different from existing learning methods.

During second and third weeks, the proportion of positive opinions has been increased to 75% whereas the ratio of negative opinion remained the same. Last week the proportion of positive opinions remained the same whereas negative opinion has been changed to hesitance. Thematic analysis of the change in positive opinions shows that educational and scientific dimensions of the model have been highlighted.

Especially for the second student, the reason of declaring positive opinion was that the program being amusing and presenting a different point of view than existing one. In the following weeks, educational aspect was also highlighted in addition to the fun side of the course. On the other hand, first student was working about literature in the school and this was his reason for finding the method to be interesting, he also contributed to the stories by making personal efforts during the application. Self-expressing skills of the second and third students have been improved during the process, as well as the improvement of their interpretation level of the stories. This fact shows that narration method addresses more than one intelligence area of the students.

Another finding is the negative opinion of the third student. Analysis of his journal revealed that the student found narration method to be long and boring at the beginning of the

process. The following week, he noted that he wouldn't be able to learn anything via this method. Then, student opinions were concentrated on the fact that the method was not sufficient alone. Last week, student didn't express any opinion; he just recorded about the subject. This situation shows student's breaking of prejudice against the method. A review of the reasons behind his attitude revealed that biased student preferred to solve test questions instead of scientific narration activities; he found that the time allocated to a story was wasted. The reason of his resistance is the fact that existing education system prioritize the success obtained from tests and test trials, thus he preferred to solve test questions.

Journal analysis shows that, at the beginning, students were cautious about scientific narration method, which was not familiar to them but this attitude changed with time. This change was based on the increasing learning during the process. It is interesting that students initially dealt with only the fun side of the method. At first glance, students didn't realize that they have learned new things during the process; they have believed to have fun during the course. But this situation changed in the following weeks. Students realized that in addition to be funny, the method had an educational side as well and started to get active roles within the process. Moreover, students' opinions express that the views of the students who were resisting learning science notions, who believed that they wouldn't be able to learn, were also changed. In addition, students' wishes about the continuation of the method for the following chapters are an important result. On the other hand, a student describing the model to be appropriate for linguistic students is a barrier in front of the model.

Further examination of the negative views revealed that the reflections of the previous education system (more teacher centered and the success was measured via tests) on the students were looming large. The thought about scientific narration being waste of time and indicating that solving test problems during this wasted time was more appropriate are important points that worth mentioning. Learner preference towards traditional systems instead of new methods during learning process and his/her eagerness towards solving test questions doesn't support life-time learning philosophy. On the other hand, it is quite natural for a student who was raised by a system where the success has been measured via tests, to approach this method with such a prejudice. Learning was perceived as a job. But, a lot of communities, aim to raise individuals who internalize learning and making it a part of life. From this perspective, we believe that, constructivist education should often refer to these kinds of methods in order to fulfill the purpose of educational systems. This is becoming a fact not only advocated by ourselves, but accepted globally by international trainers. As mentioned by Kubli (2005), scientific stories that were used in this study are like doors that are opening in front of the understanding and studying of a scientific notion.

As the result, it is possible to state that scientific stories have created a significant difference on learning (Coşkun and friends, 2012). This is due to the curiosity created by scientific stories on the students. Moreover, it has been observed that students had followed the course without getting bored, they had wondered next story of the next lesson. This increased their interest towards the course. Gil-Pérez (2002), in his study insisted that increasing the curiosity and interest of the students with such a method, motivate them to better success.

Further studies about this subject will contribute to the improvement of scientific narration. Moreover, easily applicable stories that would be selected according to learning principles will have positive contribution on the success of the students. But the points that may cause misconceptions should be avoided from given stories. Otherwise, while associating the story with daily life, some notions or events of the story may cause misconceptions and may affect learning negatively. Another unique characteristic of our study is that the stories were written or edited by the researchers themselves. In the past, the importance of these kinds of stories has been emphasized by the researchers (Kilchenmann, 1967; Rohner, 1973; Weber, 1993).

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APPENDIX - 1

IŞIĞA DOĞRU

Bir zamanlar çok uzaklarda çok zengin bir ülke vardı. Volta ülkesi. Dünyanın tüm enerjisini bu ülke sağlardı. Ülke adını kurucusu Volta'dan alırdı. Topraklarının tam ortasından çok tuzlu bir nehir akardı. Nehrin bir yakasında bakır bir yakasında çinkodan topraklar vardı. Halk huzur içinde yaşıyordu. Bir kişi hariç Cedric. Cedric 8 yaşında bir ilkokul öğrencisiydi. Ailesine götürdüğü kötü karnelerden dolayı pekte çalışkan bir öğrenci sayılmazdı. Aklında tek bir şey vardı. Chen. Tabi birde Nickolas vardı. Cedric'in ezeli rakibi. Cedric 'in ciddi bir sorunu vardı. Dünyanın sonu ya gelmişti onun için ya da gelmek üzereydi. Chen bir keman resitali için Işık ülkesine gidecekti. Işık ülkesi çok parlak bir ülkeydi. Gece gündüz hep aydınlıktı. Ülkenin kralı Kral Filaman'ın sağlık sorunları sebebiyle ülkenin dışında cam bir fanus vardı ve içindeki hava boşaltılmıştı. Chen için bu ülkede bulunmak büyük bir şanstı aslında. Cedric'te bunun farkındaydı. Fakat Nickolas ta Chen'i izlemeye gelecekti. Cedric 'in acilen bir plan yapıp hemen oraya gitmesi gerekiyordu. Ama yol çok uzundu. Üstelik Nicolas gibi bir arabası da yoktu. En yakın arkadaşı Cristian a gitti. Onun her zaman bir planı ve bu planı gerçekleştirmesi için gerekli parası olurdu. Yanılmadı. Cristian ona akşam izlediği bir filmi anlattı. Filmdeki kahraman patlamak üzere olan bir bombayı şehirden en kısa zamanda uzaklaştırmaya çalışıyordu. Yanında bir kadın ona hep ışığı takip et diyordu. "Tamam" dedi. Cedric. Işık bana doğru yolu gösterecek. Bisikletine binip yola koyuldu. Işık ülkesi öyle parlıyorduki onu görmemek mümkün değildi. Dosdoğru ışığa doğru gitti. Hiçbir yere sapmadı. Yolunu hiç değiştirmede. Ve nihayet Nickolas'tan önce oraya varmayı başardı. Buna en çok Nickolas şaşırı. Cedric kendisinden emin ışığı takip ettiğini, dosdoğru ışık ülkesine geldiğini söyledi. Cedric bir kez daha Nickolas ı geçmişti. Çünkü 8 yaşındaydı ve aşıktı.

ELEKTRONOĞLAN VE VEZİR

Bir varmış bir yokmuş. Bir zamanlar uzaklarda bir ülkede Elektronoğlan adında bir genç yaşarmış. Bu Elektronoğlan'ın birde hasta annesi varmış. Bir gün köye bir haberci gelmiş. Elinde padişah'tan bir ferman.

-Ey ahali duyduk duymadık demeyin. Sultanımızın kızı Proton Hatun çok hastadır. Kimki onu iyileştirsin sultanımız o kişinin her isteğini yerine getirecektir.

Elektronoğlan bunu duyar da durur mu? Hemen eve koşmuş. Annesine durumu anlatmış. Annesi yapma etme desede Elektronoğlan ille ben gideceğim demiş. Annesi bakmış bu oğlanın sözünden cayacağı yok kabul etmiş zoraki. Ama gitmeden önce ondan bir şey istemiş

-Ey oğul. Eğer illede gideceğim dersin önceden köyümüzün büyüğü Amper dede ile konuş. O sana yol boyunca yapacaklarını söyleyecektir.

Kabul etmiş Elektronoğlan. Koşa koşa Amper dedeye gitmiş. Amper dede köye bir yıl önce gelmiş bilge bir büyükmüş. Kimin bir derdi olsa gelip ona danışmış. Elektronoğlan da Amper dedeyi çok severmiş. Evinin kapısının önünde A yazarmış. Hem Amper dede öyle misafirperver biriymiş ki evine gelen hiç bir elektrona direnç göstermezmiş. Elektronoğlan Amper dedeyi bahçesinde bulmuş.

-Dedem demiş heyecanla. Sana bir şey danışmaya geldim.

Amper dedenin cevap vermesine bile izin vermeden anlatıvermiş durumu. Amper dede gülmüş haline Elektronoğlanın. Evladım demiş, sen çok zor bir işe kalkışmışsın. Proton hatunu

iyileştirmek çok zor. Hem daha derdini bile bilmiyorsun. Ama benim tavsiyem sana Proton hatuna hep hayatın pozitif yönlerini göster. İşe yarayacaktır.

-Tamam demiş Elektronoğlan. Yükünü de sırtına alıp yola çıkmış.

Çok geçmeden saraya ulaşmış. Baştan hiç kimse ona inanmamış. E kendi halinde bir elektron nasıl kurtaracakmış koskoca proton hatunu. Vezir buna birazda alınmış olacak ki, Elektronoğlana ancak kendisini kılıçla yenerse Proton hatunu görebileceğini söylemiş. Elektronoğlan bunun adil olmadığını bilse de kabul etmiş bir şartla.

-Bir şartım var. Bizde adettir sizin kılıcımı siyaha boyamam lazım. Onunda gün ışığında yarım saat kalması lazım.

Vezir Elektronoğlan'ın kaçmayı planladığını düşünüp gülmüş.

-Peki demiş. Elektronoğlan'ın dediğini yapmışlar. Yarım saatin sonunda kılıcı eline alan vezir çılgınlık atmaya başlamış. Herkes şaşkın olanları izliyor. Elektron oğlan gülmüş

-Sen bana adaletsizlik edersen bende seni böyle kavururum. Sıcak demirde böyle pişersin işte demiş.

Hemen o boşluktan yararlanıp Proton hatunun yanına gitmiş. Proton hatun çok ağırkanlı bir hatunmuş, hiç yerinden kalkmazmış. Elektronoğlan Proton hatunun etrafında hızla dolanmaya başlamış. Çok hafifi olduğu için bu çok kolay olmuş. Bir anda önünde sonra arkasında. Proton hatun bunu çok eğlenceli bulmuş. Ve gülmeye başlamış. O günden sonra Proton hatun çok pozitif biri olmuş. Bunu gören sultan Elektronoğlan'ı eziri yapmış. Annesini de yanına almış mutlu bir hayat sürmüşler