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## **EFFECT OF SCIENCE TEACHING SUPPORTED WITH SCIENTIFIC STORIES ON STUDENTS' ACADEMIC SUCCESS, ATTITUDES AND MOTIVATION**

*Research article*

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### Abstract

The aim of this study is to examine the effect of 'Pressure', which is taught by supporting scientific stories, on the academic achievement, attitude and motivation of 8th grade students. In this study, which aims to investigate the effects of scientific stories on student achievement, motivation and attitudes in science education, a quasi-experimental model method with pretest-posttest control group was used. The research was carried out with a total of 40, 8th grade students in a city in the east of Turkey, where only female students study. The data obtained in the study were analyzed with the help of SPSS package program. In the study, the effect of science teaching with stories on students' academic achievement, attitudes and motivations was examined. In this study, science teaching with stories was conducted in the experimental group and lessons were conducted with the traditional method in the control group. As a result of the research, it can be said that science teaching activities with stories have a positive effect on students' academic success and attitudes towards science in terms of 'pressure'. In the study, it was concluded that scientific stories were not effective in students' motivation towards science.

*Keywords:* academic success, attitudes, motivation, scientific stories,

### 1. Introduction

Constant changes in science and technology bring along the expectations of innovation in learning approaches. The focus of these expectations is not individuals who directly access information for changing needs, but rather individuals who can produce information, are entrepreneurs, can offer solutions to the problems they encounter, have communication and empathy skills, and fulfill their responsibilities towards society and culture. The integration of these skills and behaviors with the values of our society is one of the main objectives of National Education (Ministry of National Education [MoNE], 2018). In the education and training process, various teaching methods should be used so that the subjects and concepts to be taught can be understood more easily by students and adapted to current life. One of these methods is teaching supported by scientific stories. The science education taught at school remains abstract for students and the subjects are forgotten after a while because the learned concepts and information are not concretized. It needs to be associated with daily life in order to enable students to carry the knowledge beyond theory and to understand it. One of the methods to achieve this is scientific stories. The story method is an interdisciplinary and problem-based educational approach. Şen Gümüş (2009) argued that the lessons taught with scientific stories that arouse students' curiosity attract students' attention to the lesson by providing an entertaining environment. According to Tao (2003), understanding the nature of

science is the main element of science literacy and one of the most important goals of science education. Therefore, stories in science education will trigger students' desire to learn by arousing interest and curiosity about science that they encounter in daily life. It will activate their ability to comment on the science phenomena they observe in natural environments and to produce solutions to the problems encountered. Türkmen and Ünver (2012) defined the stories as follows: “Stories are the explanations of animals or plants as characters without basing any data and their situations in the form of stories and without considering scientific concepts”.

Scientific stories, on the other hand, are a different type of stories. Scientific stories are a method that finds solutions to the problems that frequently arise in daily life (Yılmaz, 2013). According to Coşkun (2012), scientific stories are the delivery of concepts to children in a story in science teaching. Stories are forms of writing that tell or describe situations experienced by one or more heroes. Scientific stories, on the other hand, are composed of abstract terms that are difficult to understand by adding them into the story according to the order of events. The emergence of the type of story, which students have been familiar with since childhood, by adding scientific elements, provides the unification of science and literature.

Science teaching based on stories is a method that can be used to facilitate students' learning, to ensure the permanence of the learned information, and to associate the science lesson with daily life. The main purpose of the story-based science teaching program is to raise scientifically literate individuals who can use their knowledge in making their daily decisions and know how science-technology-society affects each other and other people (Millar & Osborne, 1998).

Stories are forms of expression that students bring from the past and are used to. Inculcating learning by using habits is an easier and more effective way of teaching. For this reason, using story-based teaching that processes basic concepts and relationships between concepts in a story style in science education makes a great contribution to science and technology teaching. Transferring course content with stories can help students learn without getting bored and develop a positive attitude towards science.

The information that is important in science education and desired to be taught is not learned by the students. The reason is that there is a lot of knowledge and the student is afraid. As a result, the student's enthusiasm is broken. In science education with stories, the subject is given to the student in a way that they can have fun without being pressured, together with the main lines. In this way, more meaningful learning can be achieved. While shaping learning environments, arrangements should be made to increase students' interests and desires. Methods that enable students to be active in the process and change their science attitudes in a positive way should be preferred. Another method that will positively affect the science attitude is the use of stories in the education process. (Demircioglu, Demircioglu, & Ayas, 2006).

It is important to use the stories in the lessons as they affect the cognitive and affective features positively. When the literature is examined, it can be said that in the lessons in which stories are used, students learn meaningfully, feel comfortable in the lesson, think critically, and affect their affective and cognitive characteristics (Öztürk, & Otluoğlu, 2002).



With the widespread use of the constructivist approach in the education system, affective learning has also gained importance. In addition to cognitive behaviors of individuals, it is emphasized in studies that affective behaviors are also effective on learning. Motivation, which is among the affective behaviors, is one of the important elements of a learning process. The student's willingness or motivation to learn is one of the important factors that affect learning. Martin (2004) defined the concept of motivation as a driving force for students to achieve success, work hard at school and learn. Pintrich and Schunk (2013) defined motivation as the process of activating, maintaining and directing behavior towards a goal.

Motivation is an important element in the effective continuation and termination of a learning process. According to Wlodkowski (2008), learning potential decreases when motivation is low. That's why motivation is important in learning. Pintrich (2003) suggested that there is a reciprocal relationship between motivation and academic achievement.

The storytelling method is one of the methods that has attracted attention recently and is used in education. When this method is integrated into the science course, the learning process draws more attention from the students. A fun method is needed to make the subjects more permanent. The more the students enjoy the lesson, the better the learning will be. When the literature was searched, there were not many studies on scientific stories. Especially not many stories have been written on the subjects of 8th grade students. Considering the process in which students prepare for the exam, the use of scientific stories will make the lesson more fun and they will both have fun and learn.

The most important factor in any lesson that students want to learn with pleasure is the curiosity or interest felt towards the lesson. Attracting the student's interest, making them curious, and attracting their attention are the basic steps of being a science literate person. Şen Gümüş (2009) explained that since a cheerful atmosphere will be created in the lessons in which the method of teaching with scientific stories is used, the interest and curiosity of the students are directed to the lesson. For this reason, the use of stories in science education will increase children's desire to learn by being interested and curious about the science they encounter in their daily lives. Ayvaci and Çoruhlu (2009) concluded in their study that stories are effective in eliminating misconceptions about physical and chemical change. Stories can be used to eliminate misconceptions.

The aim of this study is to examine the effect of pressure, supported by scientific stories, on the academic achievement, attitude and motivation of 8th grade students. In order to achieve this general purpose, answers to the following questions were sought in the study:

1. What is the effect of teaching science with stories on students' academic success?
2. What is the effect of teaching science with stories on students' attitudes towards science?
3. What is the effect of teaching science with stories on students' motivation?

## **2. Method**

In this study, which aims to investigate the effects of scientific stories on student achievement, motivation and attitudes in science education, a quasi-experimental model method with pretest-posttest control group was used. The reason for choosing the quasi-experimental model is that it is not possible for the students in the sample to be assigned to

the experimental and control groups impartially. The experimental view of the research is presented in Table 1.

Table 1. Implementation process of the research

Groups	Pretest	Application	Posttest
Experimental	Achievement test Attitude Motivation	Science with stories	Achievement test Attitude Motivation
Control	Achievement test Attitude Motivation	Ministry of National Education Curriculum	Achievement test Attitude Motivation

## 2.1. Study group

The research was carried out with a total of 40, 8th grade students in a city in the east of Turkey, where only female students study. Personal characteristics of this study group are given in Table 2.

Table 2. Demographic characteristics of the participants

Features		n	%
Gender	Girl	40	100
Mother's educational status	Illiterate	23	57.5
	Primary School	8	20
	Secondary School	2	5
Father's educational status	Illiterate	13	32.5
	Primary school	25	62.5
	Secondary School	9	22.5
Number of siblings	Between 4-5	17	42.5
	Between 6-7	11	27.5
	Between 8-12	12	30
Computer/internet	Yes	2	5
	No	38	95
Number of books in the house	1	21	52.5
	2-3	18	40
Date of birth	2008	26	65
	2009	14	35
Study room	Yes	5	12.5
	No	34	85
Agricultural laborer	Yes	16	40
	No	23	57.5

Only female students study at the school where the application is made. When the education level of the parents of the students is examined, it is seen that they are mostly illiterate and primary school level, and the number of siblings is higher. 95% of the students stated that they do not have a computer. It is seen in Table 2 that the number of books in the homes of the students participating in the study is low and 85% do not have their own study room. 40% of the students are also seasonal migrant agricultural workers. Seasonal migrant agricultural workers are children who work in agriculture and have to stay away from school. A seasonal agricultural worker is a citizen or migrant who is a permanent or mobile seasonal worker, working in various stages of agricultural production, such as planting, harvesting, spraying, growing, in his or someone else's agricultural field, with or without a contract, in return for daily or in-kind payment. Sarper, 2009).

## **2.2.Data collection tools**

The achievement test developed by Özcan, Koca and Söğüt (2019) was used in the study. The pressure achievement test is a test consisting of 20 multiple choice questions and a KR-20 internal consistency coefficient of .73. In the study, data on students' attitudes towards the Science lesson were collected with the "Science Class Attitude Scale" developed by Geban, Ertepinar, Yılmaz, Altın, and Şahbaz (1994). This scale consists of 15 items in a 5-point Likert type. The Cronbach's Alpha reliability coefficient of the scale is 0.83. In the study, the Motivation Scale in Science Education, which was originally developed by Glynn, Brickman, Armstrong, and Taasobshirazi (2011), adapted into Turkish and analyzed for validity and reliability, was used. The Motivation Scale in Science Education, which aims to determine students' science motivation levels and types, consists of 22 items and 5 sub-factors (intrinsic motivation, career motivation, self-determination, self-efficacy, grade motivation). The Cronbach Alpha coefficient was found to be 0.83.

## **2.3.Application**

In the research, firstly, pre-tests were applied. After the pre-tests were applied, science lessons in the experimental group were taught using scientific stories in addition to the activities in the textbook, while in the control group, they were taught according to the science curriculum. The study lasted three weeks. In the experimental group, stories suitable for the subject were created by the researcher. In the process of creating a story, two story drafts were created for the subject of "Pressure", taking into account the achievements in the training program. Before starting the applications, educational story books about science at the secondary school level were researched. The stories in the books "Science with Professor Ion " and "Science Stories" were examined. An attempt was made to create a story using these stories. Stories were created for the subject of Pressure, taking into account the achievements in the Science Education Program (MoNE, 2018). Care was taken to include the concepts and achievements of each story. In the stories, attention was paid to choose the titles that would arouse interest and curiosity in the students. Questions of medium difficulty have been prepared according to the stories. Opinions were taken from 2 experts in the field of science education about these draft stories and necessary corrections were made. Each story was read twice for students to understand. After the stories were read, the lesson was started by the teacher. Then, questions about the stories were asked to the students. It was ensured that the students benefit from the lecture notes and textbooks in order to answer the questions in the story. The important parts of the story were read to the students again and again, and the important concepts were emphasized. Students were asked questions about the important parts of the story they read. The lessons in the control group were taught according to the constructivist approach as specified in the science curriculum. At the end of the

application, the Pressure Achievement Test and the Attitude towards Science Scale and the motivation scale in science teaching were applied to both groups as a post-test.

## 2.4. Analysis of data

The data obtained in the study were analyzed with the help of SPSS package program. The data of this study did not show a normal distribution. Accordingly, non-parametric statistics were used in the study. Mann Whitney U-Test, one of the non-parametric statistics, was used to analyze whether there was a difference between the pre-test scores of the experimental and control group students and whether there was a difference between the post-test scores of the experimental and control group students. Wilcoxon signed-rank test, one of the non-parametric statistics, was used to analyze whether there was a significant difference between the pretest and posttest scores of the experimental and control group students.

## 3. Findings

In the study, firstly, descriptive statistical findings related to the experimental and control groups were examined (Table 2).

Table2. Descriptive statistics analysis results

	Test	Group	N	X	ss	Min.	Max.
Achievement	Pre-test	Experimental	20	6	1.62	3	8
		Control	20	6.1	.452	2	9
	Post-test	Experimental	20	13.35	2.30	9	17
		Control	20	9.95	.294	7	13
Attitude	Pre-test	Experimental	20	55.2	5.70	42	66
		Control	20	56.3	4.93	50	71
	Post-test	Experimental	20	57.1	5.89	41	64
		Control	20	54.9	5.12	37	60
Motivation	Pre-test	Experimental	20	90.85	8.85	70	102
		Control	20	91.40	10.1	68	104
	Post-test	Experimental	20	96.65	7.00	83	107
		Control	20	93.30	7.44	75	105

When the results of the descriptive statistical analysis of the data obtained from the research are examined, the achievement test average scores were determined as Pretest (experiment=6, control=6.1), Posttest (experiment=13.35, control=9.95); Attitude mean scores Pretest (experiment=55.2, control=56.3), Posttest (experiment=57.1, control=54.9); Motivation Pretest (experiment=90.85, control=91.40), Posttest (experiment=96.65, control=93.30) (Table2).

The Mann-Whitney-U test was performed to determine whether there was a significant difference between the pre-test mean scores of the experimental and control groups that did not show normal distribution, and the results are presented in Table 3.

Table 3. Mann Whitney U test findings of academic achievement, attitude and motivation scale pretest scores of experimental and control groups

Pre tests	Group	N	Mean Rank	Sum of Ranks	U	z	p
Achievement	Experimental	20	19.98	399.5	189.5	399.5	.77
	Control	20	21.03	420.5			
Attitude	Experimental	20	20.10	402.0	192	-.217	.828
	Control	20	20.90	418.0			
Motivation	Experimental	20	19.8	396.0	186.0	-.379	.704
	Control	20	21.20	424.0			

When Table 3 is examined, there is no significant difference between the pre-test mean scores of the experimental and control groups in the science course academic achievement test, attitude and motivation scales. This shows that the groups are equivalent to each other.

“What is the effect of teaching science with stories on the academic success of students?” Findings related to this problem are shown in Table 3 and Table 4.

In the study, the pre- and post-test scores of the experimental and control groups were analyzed with the Wilcoxon Signed Ranks test (Table 3).

Table 3. Findings regarding the differences between the pre-test post-test scores of the academic achievement test

Group	Post-pretest	N	Mean Rank	Sum of Ranks	z	p
Experimental	Negative order	0	.00	.00	-3.938	.000
	Positive order	20	10.5	210		
	Equal	20				
Control	Negative order	0	.00	.00	-3.936	.000
	Positive order	20	10.5	210		
	Equal	20				

According to the Wilcoxon Signed Ranks test results for the academic achievement test in Table 3, there is a significant difference between the experimental ( $z=-3.938$ ,  $p<0.05$ ) and control ( $z=-3.936$ ;  $p<0.05$ ) groups' pre- and post-tests. When the average rank and rank totals are examined, it is seen that this difference is in favor of the positive ranks, that is, the post-test score. According to these results, it can be said that both groups achieved new gains in the application process and there was an increase in favor of the posttest between the pretest-posttest scores.

Table 4. Academic achievement post-test results of experimental and control groups

Tests	Group	N	Mean Rank	Sum of Ranks	U	z	p
Post	Experimental	20	28.08	561.5	48.5	-4.13	.00
	Control	20	12.93	258.5			

When Table 4 is examined, it is seen that there is a significant difference between the academic achievement post-test scores of the experimental and control groups, and this difference is in favor of the experimental group ( $U=48.5$ ;  $p<0.05$ ).

“What is the effect of teaching science with stories on students' attitudes towards science?” The findings related to this problem are presented in Table 5 and Table 6.

The Comparison of the Science Attitude Scale Pre-Test Post-Test scores of the students in the Experimental and Control Groups in the study was analyzed with the Wilcoxon Signed Ranks test (Table 5).

Table 5. Comparison of science attitude scale pre test-post-test scores

Group	Post-pre test	N	Mean Rank	Sum of Ranks	z	p
Experimental	Negative order	5	8.9	44.5	-2.265	.024
	Positive order	15	11.03	165.5		
	Equal	0				
Control	Negative order	8	12.06	96.5	-.480	.631
	Positive order	10	7.45	74.5		
	Equal	2				

According to Table 5, there was a significant difference between the pre- and post-test scores of the experimental group ( $z=-2.265$ ;  $p<0.05$ ), while there was no significant difference between the pre- and post-test scores of the control group ( $z=-.480$ ;  $p>0.05$ ). When the average rank and rank totals are examined, it is seen that this difference is in favor of the positive ranks, that is, the post-test score. Accordingly, it can be said that there was a positive increase in the science attitudes of the experimental group students in the process of teaching science with stories. In addition, no such significance was found for the science attitude in the control group.

Table 6. Comparison of science attitude scale post-test scores of students in experimental and control groups

Tests	Group	N	Mean Rank	Sum of Ranks	U	z	p
Post	Experimental	20	24.58	491.5	118.5	-2.21	.026
	Control	20	16.43	328.5			

When Table 6 is examined, it is seen that there is a significant difference between the science attitude scale post-test scores of the experimental and control groups, and this difference is in favor of the experimental group ( $U=118.5$ ;  $p<0.05$ ).

“What is the effect of teaching science with stories on students' science motivation? Findings related to this problem are presented in Table 7 and Table 8.

In the study, the pre-test and post-test motivation scores of the groups were compared. Table 7 shows the Wilcoxon Signed Ranks test results for the science motivation scale.

Table 7. Comparison of science motivation scale pre-test-post-test scores of students in experimental and control groups

Group	Pre-PostTest	N	Mean Rank	Sum of Ranks	z	p
Experimental	Negative order	5	9,10	45.50	-1.994	.046
	Positive order	14	10.32	144.5		
	Equal	1				
Control	Negative order	8	11.44	91.5	-.505	.614
	Positive order	12	9.88	118.5		
	Equal	0				

According to Table 7, while there was a significant difference between the pre- and post-test scores of the experimental group ( $z=-1.994$ ;  $p<0.05$ ), there was no significant difference between the pre- and post-test scores of the control group ( $z=-.505$ ;  $p>0.05$ ). Accordingly, there was a significant difference in the motivation of the students in the experimental group towards science in the process of teaching science with stories.

Table 8. Comparison of science motivation scale post-test scores of students in experimental and control groups

Tests	Group	N	Mean Rank	Sum of Ranks	U	z	p
Post test	Experimental	20	23.05	461.0	149.0	-1,382	,167
	Control	20	17.95	359.0			

When Table 8 is examined, it is seen that there is no significant difference between the science motivation scale post-test scores of the experimental and control groups ( $U=149.0$ ;  $p>0.05$ ).

Ethics committee approval was obtained for the research from Harran University, Social and Human Sciences Ethics Committee with the decision numbered 2022/61 from the meeting numbered on 15.04.2022.

## 5. Conclusion and Discussion

In the study examining the effect of science teaching with stories on the academic achievement of students, science teaching with stories was taught in the experimental group, and lessons were taught with the traditional method in the control group. There was no significant difference between the cognitive levels of the students on "pressure" as a result of the academic achievement test applied as a pre-test at the beginning. As a result of these data, it can be said that the cognitive levels of the experimental and control groups on 'Pressure' were close to each other at the beginning. As a result of the application of science teaching activities with stories, it was concluded that there was a statistically significant difference in favor of the experimental group at the  $p<0.05$  level, according to the findings obtained from the students' academic achievement test post-test on 'Pressure'. Based on this result, it can be said that science teaching with stories has a positive effect on student success. There are studies in the literature that reveal the positive effect of stories on students' academic success. In the study carried out by Ünver (2015) to reveal the effect of storytelling technique on

learning the concepts in the digestive system of 5th grade students, it was determined that teaching using the storytelling technique had a positive effect on the achievement scores of the experimental group students. In another study, Demircioğlu et al. (2006), using the story technique, increased the students' desire to learn and reached the conclusion that they provided permanent learning. Kahraman and Karataş (2012) found in their study that the activities significantly increased the academic achievement of the students. At the same time, children's interest in stories developed positively during the research process. Korkut and Ören (2018) concluded that the stories enriched with concept cartoons increased the success of the children in the study group. However, the method used did not have an effect on the motivation and attitude of the children. Köse and Yıldırım (2020) conducted a study to determine the effect of teaching the circulatory system subject of sixth grade students in the science course with story-supported classroom activities on academic success and permanence. In this study, although the post-test achievement scores of the experimental group were higher than those of the control group, a significant difference was detected between them. Considering the difference in the experimental and control groups, it was concluded that the story-supported classroom activities contributed positively to increasing the success of the students in the circulatory system and ensuring their permanence (Yıldırım, 2020).

In the study, it was aimed to investigate whether teaching activities with stories have an effect on students' attitudes towards science. According to the findings, it was concluded that teaching activities with stories had an effect on students' attitudes towards science. In the literature, there are studies that have positive reflections on students' attitudes of teaching with stories. Şen Gümüş (2009), in his study, concluded that teaching activities with stories changed students' science attitudes and made significant contributions to students' learning. Gölcük (2017) conducted a research to determine secondary school students' attitudes towards creativity and lesson in science teaching supported by scientific stories. As a result of the research, it has been concluded that the stories increase the interest, curiosity and desire of the students towards the lesson, make abstract concepts understandable and help permanent learning in the mind. There are also studies in the literature that reveal that the storytelling technique has no effect on students' attitudes. For example, Kuş (2014) concluded in his study that using scientific stories containing the life stories of scientists does not make a big difference in changing students' attitudes towards science. In the research, it has been concluded that scientific stories are not effective in students' motivations towards science. It is thought that this situation is due to the intensive science curriculum in schools. The heavy curriculum causes the student to not understand the lessons and to be confused. On the other hand, due to the lack of time, the researcher has time pressure to train some courses. The heavy curriculum in Turkey causes the student not to understand the lessons and to be confused. However, in courses such as teaching practice and school experience, teacher candidates should be encouraged to practice using these methods and techniques. In addition, it may be suggested to investigate the effect of scientific stories on academic achievement, attitude and motivation by supporting them with different alternative methods and techniques. A longer research can be carried out in order to obtain information about the attitude and motivation of the research and the change in the results when the time is increased.

## 5.1 Ethical Text

“In this article, the journal writing rules, publication principles, research and publication ethics, and journal ethical rules were followed. The responsibility belongs to XXX for any

violations that may arise regarding the article."Ethics committee approval within the scope of the research Harran University, Social and Human Sciences Ethics Committee It has been taken from the ethics committee with the decision numbered 2022/61 on 15.04.2022. There is no conflict of interest between the authors. The contribution rate of the first author to the article is 50%, and the contribution rate of the second author to the article is 50%.

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