Using ICT-Supported Narratives in Teaching Science and their Effects on Middle School Students

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ABSTRACT
Effective and sustainable science education is enriched by the use of visuals, auditory, and tactile experiences. In order to provide effective learning, instruction need to include multimodal approaches. Integrating ICT supported narrations into learning environments may provide effective and sustainable learning methods. Investigate in this research is the effect on students' achievements, self-efficacy perceptions and attitudes towards science from ICT supported fables and "Force and Motion" topics used in a 6th grade science course.

A quasi-experimental (Pre-tests and post-tests with control group) research design was adopted to conduct the study. Participants were 44 (23 of experimental and 21 of control) 6th grade middle school students. Multiple choice "force and motion achievement test", "science self-efficacy perception scale" and "attitudes towards science scale" were applied. Parametric (Independent samples t-Tests and paired samples t-Test) and non-parametric (Man-Whitney U test and the Wilcoxon signed-rank test) were used via SPSS statistical analysis software (v.16.0). As results, it has been emerged that the application had positive effect on students' achievement, self-efficacy perceptions and attitudes towards science.

INTRODUCTION
Narration-based science education is a method to facilitate students' learning capabilities to provide the permanency of knowledge learned, and to relate the science content within their daily life. The main aim of narration-based science education is to create scientific literate persons who are able to use their knowledge in making decisions and who are aware of the interaction among science-technology-society (STS) and who know how this interaction affects other people (Millar, & Osborne, 1998). Scientific literacy means that a person can ask, find, or determine answers to questions derived from curiosity about everyday experiences. It means that a person has the ability to describe, explain, and predict natural phenomena (NRC, 1996).

Affective domain of learning skills are important factors in student achievement (Alsop and Watts, 2000; Duit and Treagust, 1998; Lee and Brophy, 1996; Meredith, Fortner and Mullins, 1997; Thompson and Mintzes, 2002; Weaver, 1998). The affective learning domain includes feelings, values, appreciations, enthusiasms, motivations, self-efficacy and attitudes. Examining these factors is essential to reveal the knowledge and skill status of the students. Motivation, as one of these factors, has been accepted as a major source for student success (Freedman, 1997; Lee and Brophy, 1996). Albrecht, Haapanen and Hall (2009) found that when the motivation of the students increased, their academic achievement also increased. Contrarily, poor motivation introduces low achievement (Cavallo, Rozman, Blinkenstaff and Walker, 2003; Glynn, Taasoobshirazi and Brickman, 2007).

CONCEPTUAL FRAMEWORK
Narratives in Science
A scientific text is used to provide the narrative. According to related literature, it has been indicated that four important styles of texts are used to explain science; expository text (Wellington & Osborne, 2001) which provides a causal mechanism for how a rainbow is produced or how inherited characteristics are transmitted from one generation to the next, argumentative text (Penney et al, 2003) are texts that fundamentally take a dialectical approach seeking to make the case that a given claim is true reasoning forward from the premise to the conclusion, narrative text, and a mixture of narrative and expository text (Avraamidou and Osborne, 2009). Avraamidou and Osborne portrayed the narrative texts as below;

"… is used to form 'narratives of science' and 'narratives of nature'. In the narratives of science, scientists develop a claim, which is supported by a series of data. In contrast, popularizing articles present 'narratives of nature' in which plants or animals are the subjects and their activities are presented in a story-form, and not in a claim-data form" (Avraamidou and Osborne, 2009).

There is a significant advantage to using narratives in that students may be a part of the narration as actors and may assist to tell the story. For this point of view, narratives may increase the attention of students especially those who have low motivations (Barry et al, 2005). Millar and Osborne (1998) emphasized the value of the narratives to communicate ideas and to make ideas more coherent, memorable and meaningful. In their research report, Millar and Osborne argued that the importance of "explanatory stories". According to Millar and Osborne (1998), when the knowledge content of the curriculum presents explanatory story sets, these narratives provide better understanding of interrelated idea sets and moreover they may provide a sort of understanding which would be wished for in young people. Furthermore, such narratives may assure that the central ideas of the curriculum are not complicated by the weight of detail (Millar and Osborne, 1998).

Milne (1998) emphasized the importance of scientific stories for science education in schools. Some peoples thinks that science is a set of facts which able to be presented by an unadorned dialect (Milne, 1998). Actually, stories are very important in school science. In an examination of science textbooks, Milne (1998) has identified four different types of science stories which called (a) heroic, (b) discovery, (c) declarative, and (d) politically correct. Each of these types of story promotes a particular set of philosophical assumptions about science. These assumptions are presented implicitly within the framework of the story as truths of science.

Narratives are crucially important tools, which serve to make the knowledge meaningful and consist of relevant and consistent knowledge. Telling a story may contribute to science education as one of the oldest tools for communication. Adapting and using such activities to/in courses can make for a more engaging and enjoyable way to learn and to understand science-related information and facts. By using narratives, furthermore, learners can interpret the events faced in their daily lives and these activities may contribute the excitement of finding a solution for students (Demircioğlu at al., 2006; Türkmen & Ünver, 2012). Polhinghorne stated that the world is perceived as a narrative by people and for this reason, he emphasized that the studies done for the same world should also be dealt with in narrative form, because, thinking narratively is more effective and permanent (Clandinin & Conneley, 2000).

Students' practical skills and self-confidences can improve by ICT based narration activities. These activities may be used to make engaging science lessons. Use of technology in teaching-learning processes became an important function and information and communication technologies provide effective learning outcomes (Demirel, Yağcı and Seferoğlu, 2005). Therefore; we should integrate these technologies into teaching-learning activities to take advantage of computer and internet technologies or ICT (Akın & Baştuğ, 2005).

Technology Integration into Education

With the advancement on computer technologies, their integration has been discussed among educators for about thirty years. Since it has been seen as an essential appliance to keep up with developments and of innovation efforts, several governments invested in ICTs and embedded into their curriculums ICT related courses. In this way, they intend to provide ICT integration into teaching and learning processes in schools. Effective technology integration in the schools and learning environments requires changes in the fundamental process of teaching and learning, on the other hand it also needs changes in aspects such as teacher professional development and education standards (Su, 2009). The consensus among media researchers is that animation may or may not promote learning, depending on how it used. Griffin (2003) mentioned that the students must be technology literate in order to excel in future jobs and to be productive citizens. However, "technology integration" is not about merely technology, first of all, it is about knowledge content and efficacious teaching applications. Above all, technology integration should concentrate on curriculum content and student learning. According to Cartwright and Hammond (2003), the mean of "technology integration" has been explained as below;

"Technology integration is the use of technology to achieve learning goals and to empower students learning throughout the instructional program" (Cartwright and Hammond, 2003).

Nachmias, Mioduser ve Forkosh-Baruch (2010) indicated that ICT implementation of Israeli science and mathematics teachers in their classes was low altogether. In this study, about 22% of the mathematics teachers, and about 53% of the science teachers reported using ICT in their class. They also, pointed out the difference between the mathematics and science teachers' usage ratio. They summarized the obstacles hindering their usage of ICT in teaching and learning as school factors (school culture, resources), teacher factors (skills, self-confidence, time) and student factors (ICT skills, accessibility to ICT outside schools).

Petras (2010), conducted a descriptive study aimed to identify the eighth grade science and mathematics teachers' ICT usage in teaching and how the ICT affects their teaching. According to research findings, though science teachers were more likely then mathematics teachers to use tools that would contribute to the development of 21st century skills, both were using traditional hands-on materials rather than digital tools and resources.

Donnelly, McGarr and O'Reilly (2011), stated that considering some potential barriers was necessary to integrate ICT based resource into schools. In this study, a working framework has been developed to describe the level of ICT integration (a Virtual Chemistry Laboratory, "VCL") into teaching practice and the factors underpinning this integration. In after study interviews, teachers stated that ICT (Virtual Chemistry Laboratory) usage provided better organization, time saving, resource sharing between students and between teacher and student, better explanation and modernity in classrooms. Also, teachers talk about some barriers such as willingness and teacher beliefs about assessment.

Rehmat and Bailey (2014), investigated pre-service teachers' conceptual change related to technology integration into science lesson in a science teaching methods course. They identified improvements in students' technology definitions, increased technology incorporation into science lesson plans, and favorable attitudes toward technology integration in science teaching after instruction. This research project demonstrates that positive changes in beliefs and behaviors relating to technology integration in science instruction among preservice teachers are possible through explicit instruction.

Although investments made in Turkey to increase the computer numbers and connections to the internet, teachers could not integrated ICTs into learning environments (Demiraslan & Usluel, 2006; Tezci, 2009), as in other many countries (Kiridis, Drossos ve Tsakiridou, 2006; Lim, 2007). These results are important because they indicate that existence of technology in schools does not mean that they will be used effectively in educational environments. Their effective usage depends on the teachers and how they use technology.

While the educational environments are reorganized, enriching the learning environments with the aid of educational technologies is important to increase motivation of the students by considering class environment and learning tools. In this study, we intended to incorporate the stories (e.g. fable) that students are previously familiar with and to pay attention in the learning and teaching process by using ICT resources. Some researchers asserted that the use of narratives in science education is a powerful teaching method (Fensham, 2001; Banister & Ryan, 2001). With the support of ICTs, the use of short stories and scientific topics should be of interest to students.

Can Students Learn from Narratives (Pictures and Words)?

In designing multimedia presentations, instructional designers base their decisions on a theory of how students learn (Mayer and Moreno, 2002). According to "Information Delivery Theory of Multimedia Learning", the computer is a system for delivering information to learners and learning involves adding information to one's memory (Mayer, 2009). The instructional designer's role is to present information (e.g., as words or pictures, or both) and the learner's role is to receive the information. As some students prefer visual presentations, other students may prefer verbal presentations. Therefore, multimedia presentations would be effective in delivering information effectively to both kinds of students and they could select their delivery way.

The other view is that meaningful learning occurs when students mentally construct coherent knowledge representations (Mayer, 2009). The "Cognitive Theory of Multimedia Learning" (CTML) is based on three assumptions suggested by cognitive research. These assumptions are: (a) dual-channel assumption – humans have separate channels for processing visual/pictorial representations and auditory/verbal representations (Baddeley, 1998; Paivio, 1986); (b) limited capacity assumption – the idea that only a few pieces of information can be actively processed at any one time in each channel (Baddeley, 1998; Sweller, 1999); (c) active processing – the idea that meaningful learning occurs when the learner engages in cognitive processes such as selecting relevant material, organizing it into a coherent representation, and integrating it with existing knowledge (Mayer, 2009; Wittrock, 1974). People learn more deeply from words and pictures than from words alone. According to this theory, the cognitive process of integrating is most likely to occur when the learner has corresponding pictorial and verbal representations in working memory at the same time (Mayer and Moreno, 2002).

Rapid advances in information technology are reshaping the learning styles of many students (Dede, 2005). This change is impacting teachers and classrooms in every subject (deCastell & Jenson, 2004). In order to provide more effective and permanent learning in science courses, which integrate ICT, use short stories, provide inter-student communication, and present active learning environments, there is an important effect of student abilities such as listening, understanding and creativity. Two learning approaches that stimulate these abilities are narratives and ICTs. The combination of these two is intended to substantially increase the effectiveness of learning and teaching.

Arnold and Millar (1996), contend that the story-based approach leads to improved learning. Stories introduce characters or protagonists with different capabilities that can lead to different events, in a way which is typical of a narrative. Science stories can provide much knowledge about the nature of science. By the using of science stories, students may gain an appreciation of the interactive nature of science and see experiments as trying out explanations, rather than mere positivistic empiricism (Solomon, Duveen, Scott & McCarthy, 1992). Through stories, science emerges as a human endeavor, and students are offered insight of the importance of creativity within science processes (Ødegaard, 2003).

In this study, short stories were supported by ICT resources and used as teaching materials. Effect of ICT supported narratives on student achievement, self-efficacy perception and attitudes towards science were examined after using them.

METHODOLOGY

In this study, a quasi-experimental (pre-test and post-test with control group) research design was adopted. Control and experimental group students were part of intact classes. Despite we did not endeavor to equalize the groups by random assignment, groups were selected to have same characteristics such as gender range, socio-economical level, science achievement, attitudes towards science, self-efficacy.

ICTs supported short narratives was considered an independent variable and the scores of "achievement test" and "self-efficacy perception scale" and "attitude scale" were considered as dependent variables in this research. For this aim, when the experimental group was instructed with ICT supported short narratives, regular (curriculum oriented by aid of course and activity books) instruction was carried out in the control group. The research design and applications have been summarized in table 1.

Table 1. Research Design

Group	Pre-Test	Application	Post-Test
Control (n=21)	AT* ATSS** SEPS-SC***	Curriculum Oriented Teaching, Course Book and Activity Book	AT ATSS SEPS-SC
Experimental (n=23)	AT ATSS SEPS-SC	Course and Activity Book + Treatment with Curriculum Subjects including ICT Supported Short Narratives	AT ATSS SEPS-SC

*AT: Achievement Test,
**ATSS: Attitudes towards Science Scale,
***SEPS-SC: Science Course Self-Efficacy Perception Scale

In this research, ICTs supported short narratives was considered as an independent variable and the scores of achievement test and self-efficacy scale and attitude scale were considered as dependent variables.

Participants

Participants in this research project were students selected from a middle school in Denizli province. The measurement tools were applied for a few groups from the school and these data gathered from students were considered to determine the homogeneous two groups. To select the groups, their average scores from the measurement instruments and gender range were taken into account. As a result, 44 middle school 6th grade students contains a control group of 21 and an experimental group of 23 included in the study. Control and experimental group students were part of intact classes.

Preparation of Narratives

In the first place, the national science curriculum developed by the Ministry of National Education (MONE) has been investigated and the narrations were composed by considering the acquisitions of the 6th grade "Force and Motion" unit. These acquisitions were explained under four titles, which are; (1) Constant-Speed Linear Motion, (2) The Direction of Force and Measurement, (3) The Forces Acting Objects and (4) Weight and Gravity.

Narratives that were put down in writing were subjected to a panel review including 4 language experts (2 of them were academics and 2 of them were Turkish teachers). Furthermore, narratives were reviewed by two instructors from the science education department and three science teachers for the aim of whether they covered the goals of curriculum or not. After this, computer experts transformed the narratives into animated cartoons. The names of these short stories are; “Atik & Petek” and “Ant Force” and “Jinni Ali and Fleshy Ayşe” and the content of narratives are detailed in appendix A.

Data Collection Tools
In this research, three data collection tools were used: the first one was a 17-question achievement test to measure the achievement of the students; the second one was the Attitude towards Science Scale (Benli, 2010), which measures the attitudes of the students towards Science using a five-point Likert scale with 30 items; and the third one was the Self-Efficacy Perception Scale (Tatar et al, 2009) consists of 27 items.

The achievement test has been developed by the researchers. Draft form of the achievement test consisting 32 multiple-choice questions was prepared by selecting from test books, SBS (Placement Exam) and DPY (State Boarding Exam) in order to cover all the acquisitions of the subject. The draft form was inspected by two language experts and two science teachers. After this inspection, 12 items were decided to exclude from the draft form of the test. According to result of the pilot application (n=76), “item difficulty indexes” and “item discrimination index” were investigated and three questions were excluded from the achievement test by the results of the item analysis. Kuder-Richardson (KR-20) formula was used to calculate the reliability of the achievement test, and it is found reliable at a level of 0.79. As a result of the analysis, the 17-questions achievement test, related to the subjects of force and motion, was developed. The test was applied before and after the instructions to the 6th grade students

The attitude scale was developed by Benli (2010) and the Cronbach Alfa coefficient was calculated by the researcher as $\alpha = 0.94$. The scale consists of 30 judgment items including 17 positive and 13 negative statements. Item examples of the scale are “Science education is needed for everybody”, “Science topics are interesting for me”, “I like to deal with science in my free time”. Students were asked to sign their opinion about these statements by selecting from the options ranged between “totally agree” and “totally disagree”.

The Self-Efficacy Scale for Science and Technology developed by Tatar et al (2009), consists of five point Likert type 27 items. The Cronbach Alpha coefficient for the scale was 0.93. Perceived self-efficacy is defined as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. According to Bandura's theory, people with high self-efficacy—that is, those who believe they can perform well—are more likely to view difficult tasks as something to be mastered rather than something to be avoided (Bandura, 1977). Item examples of the scale are “I have difficulty when solving questions of science”, “I cannot do my science homework alone”, “I have abilities to be successful in science”. Students were asked to sign their opinion about these statements by selecting from the options ranged between “totally agree” and “totally disagree”.

Research Questions
The aim of the research is to investigate the effect of ICT supported scientific narrations on student science achievement, attitudes towards science and their self-efficacy perceptions. For this purpose, following research questions was examined in this research.
1. Does the instruction with ICT supported narrations improve the student’s science achievement?
2. Does the instructions with ICT supported narrations effect the student’s attitudes towards science?
3. Does the instruction with ICT supported narrations effect the student’s self-efficacy perceptions of science?

The Implementation
Lectures are carried out with the national science education curriculum in Turkey. The science curriculum internalizes and demands to apply the constructivist approaches in teaching learning process (MONE, 2004, 2013). Therefore, the instructions were carried out by 5E (Engagement, Exploration, Explanation, Extension, and Evaluation) learning cycle model (Balcı, Çakıroğlu and Tekkaya, 2006). The learning cycle is an instructional model based on the constructivist approach, which promotes conceptual change (Stepans, Dyche and Beiswenger, 1988). There are four topic titles in the unit of “Force and Motion” of the 6th grade Science and Technology course. These titles are; “Lets Calculate the Velocity”, “Lets Measure the Force”, “Balanced ad Unbalanced Forces” and “Weight is a Force” and 26 acquisitions have been defined in national science curriculum related to these topics. We prepared three ICT supported short stories, related to the subject acquisitions, for the experimental group students (See appendices).

Figure 1. Frames from the instructions of experimental group students

In this study, we investigated the effectiveness of an instructional tool in teaching subjects of "Force and Motion". The courses were planned and conducted by 5E learning cycle model in each group. In the courses of experimental group students, instructions conducted with the help of ICT-supported short stories in the phases (especially engagement, exploration and evaluation) of learning cycle. The achievement test was taken as a pre-test by both (experimental and control) groups before the instruction. After finding out that the achievement level of both groups is close to each other, teaching activities are carried out for both groups. In experimental and control groups, the teaching period is continued for six weeks at four hours per week.

Data Analysis

The quantitative data were analyzed by using the SPSS 16.0 software. A lot of statistical tests (e.g. t-test) require that the data are normally distributed and therefore we should always check if this assumption is violated. One common test for checking the normality of data is Shapiro-Wilk test (Peat & Barton, 2005), which works well even for a small sample size. Normality of the control and experimental group data were assessed and according to results; achievement test data was normally distributed in pre- (W=.959; p=.116) and post-test (W=.978; p=.543). Other data (Gathered by the attitudes scale and self-efficacy scale) was not normally distributed. For this reason, nonparametric statistical technics were decided for evaluation of the data of attitudes and self-efficacy. To compare the achievement test mean scores, the Independent-Sample t-Test and Paired-Sample t-Test were used. Man-Whitney U test and the Wilcoxon signed-rank test was considered to analyze the difference in pre-test and post-test raw scores of attitudes and self-efficacy of the groups.

FINDINGS

According to results of Independent Sampled t Test summarized in table 2, there is no significant difference between achievement scores of the control and the experimental group in pre-application test [t(43)=0,78 p>.05]. According to these results, it can be said that the students of both control and experimental groups are equivalent in terms of science achievement levels prior to the application.

Table 2. The Comparison of Achievement Levels of Experimental and Control Group Students on Pre- and Post-Test Scores

Test	Group	N	X	SD	df	t	p	Cohen's d
Pre-Test	Control	21	7.48	3.69	43	0.78	0.435	
	Experiment	23	6.70	2.85				
Post-Test	Control	21	8.33	3.19	43	1.29	0.04	-0.64
	Experiment	23	10.26	2.80				

Level of Confidence α=0.05

According to the results summarized in the table 2, there is a statistically significant difference between the post-treatment test scores of the control and experimental group students [t(43)=1,29 p<.05]. According to these results, it can be claimed that the course carried out with the help of information technology-assisted short stories is more successful than the regular course. According to some researches made by Tavukçu (2008), Coşkun (2010) and Büyükkara (2011), adding computers to the learning environments has positive effects on achievement. Proceeding from this point of view, we can interpret that the integration of education tools, which have audio and visual features, has a positive effect on student science learning.

According to the Paired-Sampled t Test results given in the Table 3, there is a significant difference observed between the pre-test and post-test scores of the students in terms of achievement (t=7,80;p<.05). The reason for this significant difference can be interpreted that the knowledge level of the experimental group students is increased with the application of story-assisted courses. According to these results, it can be said that the method used in the experimental group was increased the success of the students. In another study, Kahraman and Karataş (2012) was aimed to determine the effect of the narrations containing "history of science" subjects on students' science understanding. As a result of this study, it is probable that the use of these stories in the courses help students to understand the subject matter and demonstrate that understanding on a test. Our results are consistent with the results of the studies conducted by Kahraman and Karataş (2012).

Table 3. The Comparison of Pre-Test and Post-Test Scores of the Control and Experimental Group Students in terms of Achievement

Group	Tests	N	X	SD	t	p	Cohen's d
Experimental	Pre-Test	23	6.70	2.85	7.80	0.000	-1.26
	Post-test	23	10.26	2.80			
Control	Pre-Test	21	7.48	3.69	0.984	0.337	
	Post-Test	21	8.33	3.19			

Level of Confidence α=0.05

According to Table 3, there is no significant achievement difference statistically between the pre-test and post-test scores of the control group students, who had regular Ministry of Education curriculum without stories. However, there is an increase in the post-test when the average scores are observed (t=0,984;p>.05). The reason why there is no significant difference between the scores might be due to the typical increase of the course achievement. According to the study of Kahraman (2007) named "The effects of computer-assisted lectures on the attitude and achievement of the 7th grade students in the Physics subject of Science Course" an increase but no significant difference was observed in the control group in terms of achievement. However, even though there was no significant difference between pre- and post-test achievement scores of the control group, there was an increase in the post-test scores. Our study is consistent with the Kahraman's study. Based on these results, it can be interpreted that in addition to the textbooks and workbooks of the course, performing other activities can improve student achievement.

A Mann-Whitney U Test was used to compare the ratings of attitudes towards science for the 21 students in the control group and the 23 students in the experimental group. The mean rank of the ratings for the control group was 19.19, versus 25.52 for experimental group (see Table 4). Using a Mann-Whitney U test, the two distributions of ratings were not found to differ significantly, z = -1.635, p > .05, abs(r) = .25. For abs(r), a .1, .3, and .5 represents a small, medium, and large effect size, respectively (Kennedy, Russom and Kevorkian, 2012).

Table 4. The Comparison of Pre-Test and Post-Test Mean Ranks of Attitude

	Mean Rank			
Test	Control Group (n=21)	Experimental Group (n=23)	z	p
Pre-Test	19.19	25.52	-1.635	.102
Post-Test	14.36	29.93	-4.020*	.000

Level of Confidence α=0.05

According to post-test results, significant group differences were found in the students' attitudes towards science. The mean ranks of the ratings for the experimental group students were significantly higher than the control group students (see Table 4). The distributions of attitude scores between experimental and control group were found to differ significantly, z = -2.140, p = .032, abs(r) = .32. According to these results, it can be claimed that adding ICT-supported stories to the lectures will increase the self-efficacy perception of the students.

Table 5. The Comparison of Pre-Test and Post-Test Raw Scores of Self-Efficacy (Wilcoxon signed-rank test[a])

Group	Pre- and Post-test	n	Mean Ranks	Sum of Ranks	z	p
Control	Negative Ranks	12	11.67	140.00	-1.307[b]	.191
	Positive Ranks	8	8.75	70.00		
	Ties	1				
Experimental	Negative Ranks	19	11.66	221.50	-3.686[b]	.000
	Positive Ranks	2	4.75	9.50		
	Ties	2				

Level of Confidence α=0.05 a: Wilcoxon signed-rank test. b: Based on positive ranks.

A Wilcoxon signed-rank test was performed on pre- and post-test raw scores on each of the groups. The test showed that there was a significant difference between pre- and post-test scores of experimental group (Table 5). According to the results in Table 7, students demonstrated a significant improvement in experimental group (Z=-3.686, p=.000, abs(r)=0.56). But in experimental group, there was no significant differences between pre- and post-test self-efficacy raw scores (Z=-1.307, p=.191, abs(r)=0.20). These results suggest that the instruction in experimental (with the assist of ICT supported stories) group had a positive impact on self-efficacy perceptions of students.

CONCLUSION AND DISCUSSION

According to the results of the study, a positive and significant difference occurs in favor of the experimental group students in terms of achievement and self-efficacy perceptions, when performing the science courses assisted by the ICT based short stories. Besides the attitude levels of students increased significantly in both (control and experimental) group (see table 5), there was a significant differences between pre- and post-test mean ranks of experimental group students. It is revealed that combining familiar stories with ICTs, which they like to use in their daily life, and using this combination in learning and teaching process as tools or materials have significant and positive effects on the students' achievement and self-efficacy.

According to the results of the study; we observed that the achievement, self-efficacy perception and attitude levels of both experimental and control group students are almost equivalent prior to the application. However, the application process has a positive effect in favor of the experimental group. Some differences occurred after the application in terms of achievement, self-efficacy perceptions and attitude towards science. When the post-test scores are considered, there is a meaningful difference between the pre-test scores of the experimental group students in terms of achievement, self-efficacy perceptions and attitude towards science. However, although there is an increase in the test scores of the control group students when the pre-test scores and post-test scores are compared, this increase is not statistically significant. In addition, it is observed that the attitudes and self-efficacy perceptions of the control groups towards science have not been changed.

ICT support in educational environments is helpful and effective in learning and understanding science. Addressing to more senses provides more permanent learning. There is an important consideration about how to use ICT so that it supports learning and teaching. In this study, we utilized the narratives (maybe called as fables) and supported them by ICT. Technological devices and software served as tools that support learning. We developed a new instructional strategy with ICT support by including the narrations which the students already familiar. Therefore, we improved the learning outcomes in learning cycle model by using the stories in the phases of the cycle.

Consequently, there are a lot of study emphasized the importance technology (ICT) usage and effect of story based approach in education. Therefore, in this research the use of ICT supported scientific narratives that make visually and aurally contribution as teaching materials and their effects on students were investigated.

A limitation of the present study was the relatively small sample size. Therefore, the generalization of the results is difficult. Further research is needed to better understand the potential effects on learning and attitudes towards science and self-efficacy perceptions of science. Though the stories is challenging and attractive, preparing them requires computer skills and abilities and software knowledge and time. This was another limitation of the present study and the further research. We transformed them into computer animations by the help of a computer expert. There was a cost of this process for this study. If the researchers can provide a found or they have adequate computer ability or knowledge, this should not be seen as limitation.

Although use of ICT supported narratives did not increase the student achievement excessively, it improved the students' attitudes towards science positively. According to this result, this new material was recommended for the other science specific content and concepts even other disciplines (social science, mathematics, etc.). In this study, effect of ICT supported narratives on achievement, attitudes and self-efficacy was investigated. For the future research, investigating the effect of this instrument on different variables is recommended.

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APPENDIX A (The narratives and the Screenshots from the Animations)

The Narratives	Screenshots

Atik & Petek

The story of Atik and Petek includes the gains related to "an object moving on a straight line with a constant velocity". In the story of Atik and Petek, the part showing that Atik travels a 200-meter path in 40 seconds, whereas Petek travels the same path in 100 seconds, includes the gains such as; "explains the relationship between the distance travelled, the elapsed time and velocity" and "measures the distance travelled by the object and the amount of time spent". The part which includes the word of Queen as "it took much longer to travel the same distance, thus Atik is faster than you" in reply to Petek's objection as "I reached the same flower and brought the pollen, this is injustice", also includes the gains as "calculating the velocity of the object by using the distance travelled and the time elapsed" and "refers to the unit of velocity and use it".

Ant Force

The story of the Ant Force includes the gains related to "forces to be applied to objects". In the ant force story, the part includes the saying of Ant Kazım to Elephant Fikret as; "You five-person family and my five-person family will pull a rope" includes the gains of "observation of more than one force can be applied to an object" and "the diagrams that show the direction of the forces applied to the object". The part that includes the saying of Fox Veli as; "yes dear audience, since no one is moving, then the forces are balanced" covers the gain of "if the net force on an object is zero, then the object is under the influence of balanced forces", "making some estimations about the required force to be applied to an object to make it fixed if one or more forces are acting upon the object, and testing the estimations" and "concludes as a fixed object is under influence of balances forces". In this part, everybody is so surprised, because five ants were pulling five huge elephants away. The part includes the saying of Fox Veli as; "yes dear audience, since the balance is broken, you observe the unbalanced forces" also includes the gains of "if the net force acting upon an object is less or more than zero, then the object is under the influence of unbalanced objects". The part includes the saying of ants as; "there were 100 moles right behind us pulling the rope, and we won the competition with the help of them" includes the gain of "the net force (resultant force) can be considered as one force, where two or more forces are affecting an object, but their total force implies as one".

Jinni Ali and Fleshy Ayşe

The sorty of Jinni Ali and Fleshy Ayşe covers the topics related to "weight subject". In the story, the part includes the saying of Ayşe as; "I feel very light, I think this trip made me lose some weight, look I can jump easily", and saying of Ali in return as; "your weight is 600 N on Earth, but only 100 N on Moon; that is the reason why you feel so light" also includes the gain of "explanation of the weight differences of the same object in different planets while the mass of the object is always constant". The part includes the saying; "This 60 kg is our mass. It will not change either on the Moon or on Earth. Even if we go to Saturn, it won't change. What has changed is our weight. Weight is a result of the gravity of Earth.", also includes the gains of "the force bounding the objects to Earth is called Gravity" and "the gravity force acting upon the object is called weight".