

Use of Fun Book in Science Education: Sample Applications

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Abstract

This study is to determine the effect of using a fun book in a science course to enhance academic achievement and retention and to investigate student's views on the use of the fun book. Another aim of the study is to set an example for process evaluation in using fun lessons for higher education students. Participants used the fun book for reasons such as learning and not forgetting the subjects, repeating the subject in a fun way, and taking notes from the teacher. The positive aspects of using the fun book was that it enabled students to learn subjects while having fun, prevented them from forgetting material, and it made it easier for teachers to take notes by preparing for the exam. The negative aspects of using the fun book were that students said that they considered it to be exhausting and that the intensive writing caused hand pain.

Keywords: academic achievement, crossword, fun book, science, student opinions

Introduction

Science lessons provide an understanding of the events in daily life and how those events can be used in the solution of real-world problems. While interesting, these lessons can be a challenge for students. This challenge stems from difficulty in recognizing the Latin names of living things, understanding growth and reproduction, and learning the general characteristics of mitosis meiosis and its phases. Author (2019) found that elementary students can recognize the solar

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system, see light, or hear sound, but because they cannot hold or touch it, they have complications in learning. The challenges in learning science can be reduced by learning how a student can reconstruct something in their mind (Cook, 1994; Demirkuş, 2019) which leads to how well the students will eventually master the material.

This article examines how higher education faculty in Turkey can creatively imagine how to best teach science lessons with the intent to then teach these techniques to teachers. It is known that repetition is an activity that leads to better comprehension (Bromage & Mayer, 1986; Till, 1998) and that repetition of a subject learned at school, at home, or in a work environment affects permanent learning. Application of the subject in daily life is another factor in making learning permanent (Karpicke & Roediger, 2008; Author, 2018). When an individual has the opportunity to practice school learning or embellishes it with examples that one understands well, learning is more permanent (Ministry of National Education [MoNE], 2018). Finally, lasting learning comes from is repeating the learned information in the form of homework. One way to capture these repetitions is to use the fun book method.

Conceptual Framework

Although fun is defined as the opposite of hard work, it nonetheless, is an essential element for motivation (Appelbaum & Clark 2001). In science, fun has an important place in ensuring student motivation. There are fun applications for science in developing technology, tablet, computer and interactive board applications (Demirkuş & BatıhanGüzel, 2019; Gopalan et al., 2016). Most importantly, students like to use these applications (Idin & Dönmez, 2017). Fun, as an activity-based learning (Dewey, 2001), influences the student attitude towards the course and it is known that students who are interested in science careers have a good attitude towards science lessons (Gibson & Chase, 2002). It is also known that middle school students' attitudes and motivations towards science classes are not always positive (Azizoğlu & Çetin, 2009). Yet, when fun is introduced in the learning process, all students become aware that fun leads to learning, which helps to build positive connections to how students view science. The focus of this article is to show how higher education

can model fun books as a way to teach teachers about the need to raise interest in all students towards science lesson.

In activity-based science education, the aim is to teach lessons with activities that provide the easiest understanding of the course. Technological methods are used in traditional methods (Yeşiltaş et al., 2017). One of the important factors here is to include the components of language such as speaking, listening, reading and writing as much as possible in the activities (Roth & Worthington, 2011). The teacher needs to be aware that activities, such as reading and writing, need to be constantly dynamic. Students can remember their learning when they have fun at the activities. Because learning becomes easier when the individual has fun or is happy, this builds the context for joyful substances (Ünal & Ünal, 2003). It is our duty as higher education faculty to teach teachers how to ensure that students see science as fun starting from the foundation. When the student has fun in learning, there is a greater chance that the individual will remember the information learned from early childhood to higher education (Hartnett, 1941). This also then applies to university students who will likewise learn better through fun (Zhu, 2019). The success of the student in higher education is mostly based on their permanent learning from the previous years.

The fun book approach is a way of repeating school learning in a fun way. The main purpose of this book is to ensure that the information learned is permanently learned. In this process, the students who use the book repeat the subject, reinforce the information and apply the problems they learned at school in various ways at home. The student repeats learning by using techniques such as poetry, painting, caricature, puzzle, riddle, story, question, humor, play, subject summary, writing, acrostic, news, voices or information in his head. Teachers can offer help in how to best use the fun book or sample applications that focus on repetition of poems, puzzles, riddles or games in the form of homework.

Literature Review

In a review of the literature, I found emerging research on fun in science education. Gopalan et al. (2016) found a positive and significant relationship between interest, fun and entertainment and students' motivation to learn science. Mutlu (2018) determined that learning experiences in personal entertainment environments (such as desktops, laptops and tablets, smart phones and media, television, cinema, theater, concerts, interviews, exhibitions) were effective in terms of later recognition, meaning and management. Ulus (2015) conducted a review of a magazine, published between 1913 and 1919 that included articles, poems, competitions, and news as an early use of integrating fun into education. In addition, to educational activities, the journal also instilled social awareness. In the above studies, writing activities show that awareness is formed in an individual and that learning is effective.

Ok and Çalışkan (2019) found that fun was a way to reinforce homework and to prevent forgetting. Another study determined that the positive approaches of the teacher in assigning such assignments had a positive effect on the students (Sherman et al., 2008). Other research used tests in the format of puzzles to determine academic success (Coşkun et al., 2012). Finally, Akçay et al. (2014) found that multiple writing activities had a positive effect on student academic achievement and concept learning. When the findings of the above studies are considered, many writing activities, homework and extracurricular activities have a positive effect on keeping students' academic success and learning in mind.

Research is documenting case studies to show that different types of students apply fun in different ways. Arslan and Babadoğan (2005) thought that there is no gender-related learning style in science classes, and that female and male students will be equally interested in the fun book. Yet, there are also differences, such as a NAEP (2014) study that showed that younger age (9 ages) groups read to have more fun than older age (17 ages) groups. Finally, there is emerging research on the implications of fun activities and homework using fun books for higher education students.

Purpose of the Research

The main purpose of this study is to determine the effect of fun book used in extracurricular homework activities in a science course and the effects of the fun book on academic achievement and retention of knowledge. Student's views on the use of the fun book were also investigated. Teachers think that science education should be fun (Glackin, 2016), but generally have concerns about how to do this. Higher education faculty play a central role in testing fun and then teaching best practices to teachers. In this study, a sample study of middle school students is presented with the development of best practices to help reduce teacher anxiety. Finally, this study sets an example for process evaluation that can then be applied to higher education students. In this context, the answers of the following questions were sought: 1) According to the puzzle and academic achievement test findings, is there a significant relationship between the experimental and control groups in terms of academic achievement before, after, and one month after the application? 2) What are the participants' views on the fun book? 3) Why do participants use the fun book? 4) What are the positive and negative aspects of the fun book?

Method

Mixed method was used in the study. With this method, it is aimed to complement the qualitative and quantitative data (Creswell, 2017). Experimental design with experimental and control groups was used in the quantitative part of the study. Experimental study was used to see how effective a particular intervention was in solving a particular problem under controlled conditions and in resulting retention. Experimental and control groups were randomly selected (Büyüköztürk, 2009; Çepni, 2010; Metin, 2014) for the teaching of two 6th grade science subjects, Sound and Features. The class was divided into two groups and both participated in the experimental study in which the fun book was consistently used. The control group did not use the fun book consistently. A fully structured interview form was used in the qualitative aspect of the study to determine the participants' thoughts about the fun book. The following steps were used in the study.

Research method Application Steps

Research

To be able to determine the use of fun book in science classes and make recommendations for best practices in the teaching of science teachers.

Tools

Fully structured interview form, puzzle form, academic achievement test.

Application

The study lasted 9 weeks. The classes randomly selected as 6 / A is experimental 6 / B is control groups. Control group students are not allowed to use the fun book throughout the application. In the qualitative dimension of the study, thoughts about fun book were taken from both groups.

Conclusion

The results of the study are presented in the findings section.

Participants

Homogeneous (analogous) samples were used in the study. The aim in the analogous sample is to determine the status of groups of similar characteristics in a subject in order to collect the data effectively (Creswell, 2013). The research was conducted with 6th grade students in a public school in Eastern Anatolia Region during the 2018-2019 academic years. A total of 57 students participated in the study, depending on the volunteerism principle. The socio-economic status of the participants was similar. The families of the majority of the participants are engaged in farming with a focus on agriculture and animal care.

Data Collection Tools

Puzzle form and academic achievement tests were used to collect quantitative data. The puzzle form helps to determine the success of learning the concepts and the academic achievement test to determine the academic success. The puzzle test is an ideal scale for remembering what is learned and to assess what was the most frequently remembered and comprehended. The puzzle was prepared for the follow-up of the academic success of the participants in both scales. These

scales were prepared according to the subject gains. While the puzzle remains at the level of comprehension, the achievement test includes questions at the level of comprehension, comprehension and practice. A fully structured interview form was used for the collection of qualitative data. With this form, it was aimed to determine the views and thoughts of the participants towards the fun book.

Analysis of Data

The data of the measurement tools used in the study were analyzed with the help of Microsoft Excel program and SPSS. Descriptive and content analyzes and techniques such as Independent Sample T-test, frequency and percentage values were used. In the content analysis, the state of transferring the learned information in the mental structure of the individual to the fun book is examined. The names of the participants were coded with numerical values. Experimental group "EG", Control group "CG", frequency "f" and percent "%" were taken.

Reliability and Validity

Within the scope of the reliability studies, the status of the sample group was explained in detail, the existing roles were explained, the conceptual framework and data collection and analysis were presented. In addition, these data were supported by descriptive analysis and content analysis (Glesne, 2013; Merriam, 2013). Assistance was obtained from another faculty member in the preparation and scoring of measurement instruments. For the coding and scoring, reliability was calculated using the formula of Miles and Huberman (1994). According to this calculation, 85 % confidence coding was performed throughout the study. In fact, according to Miles and Huberman (1994) 80 % and above has been accepted as reliable (Arik & Yilmaz, 2017). In the descriptive and content analysis of validity of the research, direct quotations were given and the accuracy of the research results was shown (Merriam, 2013). The codes used in the content analysis and the interpretations were done in depth. The names of the participants group are coded. In addition, Academic achievement test was prepared by the researcher based on the subject gains. The reliability and validity study was performed; it was re-performed during the study. The achievement

test, which consisted of 18 questions, was piloted with 90 students at a public school in Van. As a result of the item analysis, items with a substance difficulty index below 0.20 and above 0.75 and items with a substance discrimination index below 0.29 were excluded from the test. The Cronbach Alpha value of the academic achievement test was found to be 0.79. In addition, as a result of item analysis; the item difficulty index of the test was found to be 0.59 (Very good), and the item discrimination index of the test was 0.57 (Very good discriminated). There are 17 questions in the academic achievement test. The questions were prepared to cover all gains. The questions are at the level of recall, comprehension and practice. These levels were used because the gains were at the recall, comprehension, and practice levels. In addition, the structure and appearance validity of the test was taken with expert opinion. In general, these values prepared for measurement tools show that the scales will yield similar results when used in other national or international studies (Metin, 2014; Yıldırım & Şimşek, 2013).

Limitations of Research

The study is limited to 57 students in a small district of Eastern Anatolia Region. The research is limited to the topic "Sound and Features" of the 6th grade science.

Findings

The data obtained in the study are presented below in order of research problems. The results of the pre-test, post-test and permanence test of the research and the opinions of the participants about the fun book are presented respectively.

Table 1

Independent Sample T-Test according to Pretest Results

Tests	Groups	N	Mean	Standard deviation	t	df	p
Crossword	6A	28	21.17	15.37	-5.27	54	0.00
	6B	28	48.73	23.01			
Achievement test	6A	28	48.53	15.74	0.95	54	0.35
	6B	28	44.12	18.98			

Table 1 gives the results of independent sample T-test analysis of the data obtained from the pretest applications of the puzzle and achievement tests. According to this, it is understood that p

value is 0.00 and in favor of 6B groups in the crossword test of the groups. Because the average score of the 6B group is considerably higher than the average score of the 6A group. When the achievement test data were examined, it was found that p value was 0.35 and there was no significant difference between the groups.

Table 2

Independent Sample T-Test according to Posttest Results

Tests	Groups	N	Mean	Standard deviation	t	df	p
Crossword	6A	27	62.96	29.05	-3,833	54	0.000
	6B	29	89.90	23.42			
Achievement test	6A	27	58.39	21.27	-2,706	54	0.006
	6B	29	73.83	21.42			

Table 2 gives the results of independent sample T-test analysis of the data obtained from the posttest applications of the crossword and achievement tests. According to this, it is understood that p value is 0.000 and in favor of 6B groups in the crossword test of the groups. Because the average score of the 6B group is considerably higher than the average score of the 6A group. When the achievement test data are analyzed, it is seen that p value is 0.006 and it is in favor of 6B because of the group averages.

Table 3

Independent Sample T-Test according to the Permanence Test Results

Tests	Groups	N	Mean	Standard deviation	t	df	p
Crossword	6A	26	68.68	24.41	-2.467	46	0.017
	6B	22	87.01	27.05			
Achievement test	6A	26	59.50	21.52	-1.864	46	0.068
	6B	22	72.46	26.58			

Table 3 gives the results of independent sample T-test analysis of the data obtained as a result of the permanence test applications of crossword and achievement tests. According to this, it is seen that p value is 0.017 and in favor of 6B group in the crossword test of the groups. Because the average score of the 6B group is considerably higher than the average score of the 6A group. When the achievement test data were examined, it was found that the p value was 0.068 and there was no significance between the groups. In addition to these data, a fully structured interview form

analysis, in which participants' views on the fun book, is presented below. Fully structured interview form data descriptive and content analyzes is presented respectively.

The fun book is an extracurricular activity that is required for the repetition of subjects in the science course. The students carry out this activity as homework. The teacher checks the students' books during the course hours. In spite of this obligation of the course teacher, some students did not use this book.

Table 4

Experimental and Control Groups Entertainment Book Use Cases

Groups	Fun book users	Not users fun book	Total
Experimental Group (6 / A)	18	9	27
Control Group (6 / B)	29	0	29

Table 4 shows that 18 students from the experimental group used the fun book while 9 do not. The entire control group uses the fun book. Since the experimental and control groups were chosen randomly in the mentioned application groups, the students who did not use the fun book despite the necessity came into the experimental group. The data obtained as a result of qualitative analysis are presented below. Descriptive analysis and some data are presented with tables. Content analysis is given with quotations.

Table 5

Fully Structured Interview Form Most Repeated Expressions

Expressions (N: 47)	f	%
I learn subjects with fun	24	51.06
To learn and not forget topics	20	42.55
Fun lesson to do repetition	19	40.43
Repeating topics and makes me not forget	17	36.17
It's very tiring and it hurts my hand	12	25.53
It takes too much time	9	19.15

Table 5 shows that the most repeated expressions appear in the interview form. According to this, the first three most frequently repeated statements are; I am learning subjects having fun with 51.06 % (f: 24), to learn and not forget the subjects with 42.55 % (f: 20) and to make fun

repetition of the course with 40.43 % (f: 19). Theme-category and codes made out of this data are presented below with excerpts.

Theme 1 Why Fun Book

The reasons for using the fun book were analyzed under this theme. Table 6 obtained as a result of descriptive analysis in the theme is presented below.

Table 6

The Results of the Descriptive Analysis of Why Fun Book

Category	EG (N:18)	f	%	CG (N:29)	f	%	Tot (N:47) (f)	Tot (%)
To learn and not forget topics	2,3,4,6,7,9,10,11,14,17	10	55.56	2,6,9,10,15,16,18,20,21,24	10	34.48	20	42.55
Fun repetition to do lesson	8,15,16	3	16.67	1,3,5,7,8,12,13,16,17,19,20,21,23,27,28,29	16	55.17	19	40.43
Teacher wants or to take notes	1,5,12,13,18	5	27.78	4,14,22	3	10.34	8	17.02

Table 6 shows that the majority (55.56 %) of the experimental group students used the fun book to learn and not forget the subjects. The majority (55.17 %) of the control group students used the fun book to make repetitive lessons. In general, it is understood that 42.55 % of all students used the fun book to learn and not forget the subjects. Apart from these data, the content analysis excerpts of the categories are presented below.

Category 1 To Learn and Not Forget Topics

Under this category, it is stated that the fun book is used to learn and not forget the subjects. Random excerpts from both the experimental and control groups are presented below.

Not to forget what we learned (EG2). To spend summary and learn better (EG9). In lessons, everything or so, to understand the subjects of things (EG17). I'm using it to learn something (CG2). To better understand and reinforce issues (CG20). For better understanding of questions, knowledge, knowledge, riddles, science subjects (CG24).

As it is understood from the quotations above, the participants were found to use the subjects for reasons such as “*not forgetting*”, “*learning*” better, “*understanding*” and “*reinforcing*”. In general, it can be said that the participants used the fun book to learn and not forget the subjects.

Category 2 Fun Repetition to Do Lesson

In this category, it is stated that the fun book provides the repetition of fun. Random excerpts from both experimental and control groups are presented below.

It saves. The subjects remain in our minds (EG15). We repeat things and become fun (EG16).

For fun repetition of lessons like cartoons (CG7). To repeat the science in a fun way (CG19).

To repeat the topics we want in a fun way (CG28).

The excerpts above show that the students use the “*fun book*” to be able to do it “*again*” and to “*have fun*”. In general, it can be said that the participants used the fun book because they could repeat the subject in a fun way.

Category 3 Teacher Wants or to Take Notes

In this category, it is stated that the fun book is the teacher's request or kept for taking notes. Random excerpts are given below.

I use the fun book because my teacher wants it (EG1). To receive an oral grade (EG12). So that our minds can study the fun book for exam preparation, preparation for class (EG18).

Because to get points (CG4). Because our teacher wanted (CG14: 22).

Excerpts show that the students use the fun books to prepare for the “*exam*”, to prepare for “*class*” and to take “*notes*”. In addition, it was determined that some of the participants used the “*fun book*” because of their teachers' request. In general, it can be said that some of the participants used the fun book for exam preparation, taking notes and requesting teachers.

Theme 2 The Positive Aspects of the Fun Book

Under this theme, the positive aspects of the fun book were analyzed. Table 7 obtained as a result of the descriptive analysis in the theme is presented below.

Table 7

Descriptive Analysis of the Positive Aspects of the Fun Book

Category	EG (N: 18)	(f)	(%)	CG (N: 29)	(f)	(%)	Tot (N:47) (f)	Tot (%)
Learning the subject with fun	1,5,9,12,13,17	6	33.33	1,2,6,8,9,12,13,15,16,17,19,20,22,24,25,26,28,29	18	62.07	24	51.06
Repeat and not forget	2,3,4,6,8,15,16	7	38.89	3,11,13,14,15,18,20,21,23,27	10	34.48	17	36.17
Exam preparation and taking notes	1,8,10,18	4	22.22	4,7	2	6.90	6	12.77

Table 7 shows the experimental group mostly (38.89%) stated that the positive aspect of the fun book was repetition and not forgetting. The control group students (62.07%) stated that the positive aspect of the fun book enables them to learn by having fun. In general, 51.06% of all students stated that as a positive aspect of their fun book, they provided learning with fun. Apart from these data, the content analysis excerpts of the categories are presented below.

Category 1 Learning the Subject with Fun

In this category, it is stated that the fun book provides learning with pleasure. Random excerpts are presented below.

We learn better. We learn more fun. We do not forget the subject by repeating (EG9). While we use the fun book, we both understand and have fun doing things (EG17). It's fun and keeps it in mind (CG13). We reconsider a topic and understand it better by doing fun things (CG15). Learning scientific things fun (CG22).

When the citations of the participants are examined, it is possible for them to do it “*again*”, to “*understand*” and “*learn*” the subject better. Most importantly, most students had “*fun*” with the activities. In general, it can be said that the majority of the participants stated that they had fun as a positive aspect of the fun book and provided learning the subjects.

Category 2 Repeat and Not Forget

It is stated in this category that the fun book serves to repeat and not forget the information. Random excerpts from both experimental and control groups are presented below.

It repeats the subject and makes us not forget (EG2). It allows us to consolidate the issue better (EG8). It allows us to repeat and learn (EG16). We understand better by doing it again (CG11). Review and understand the subject (CG18). When we repeat what we have learned, we cannot forget (CG21).

When the above excerpts were examined, it was determined that the students used expressions that they were able to “reproduce”, “reinforce”, facilitate “understanding” and prevent “forgetting”. In general, it was determined that students perceived repetition prevention as one of the positive aspects of entertainment book.

Category 3 Exam Preparation and Taking Notes

In this category, it is stated that the fun book provides preparation for the exams and is useful for taking notes from the course. Random excerpts from both groups are given below.

The fun book increases my oral grade (EG1). It gives me high marks (EG8). Studying helps to prepare for the exam (EG18). The positive side of the fun book brings me points (CG4). The positive side makes notes (CG7).

When the excerpts are examined, it is understood that the students stated that the fun book had positive aspects such as “high scores” and facilitating the preparation for the “exam”. Although they are small in number, it can be said that some of the participants stated that they prepared the exam as a positive aspect of the fun book and that it provided taking notes.

Theme 3 The Negative Aspects of the Fun Book

Under this theme, the negative aspects of the fun book were analyzed. Table 8 obtained as a result of descriptive analysis in the theme is presented below.

Table 8

Descriptive Analysis of the Negative Aspects of the Fun Book

Category	EG (N:18)	(f)	(%)	CG (N:29)	(f)	(%)	Tot (N:47)	Tot (f)	Tot (%)
Very tiring and hand pain	1,9	2	11.11	4,7,16, 17,18, 20, 23,24,26,28	10	34.48	12	12	25.53

Taking too much time	1,2,6,10	4	22.22	3,15,16,19,22	5	17.24	9	19.15
No negative aspects	5,7,8,12,15,16,17,18	8	44.44	2,8,9,10,13,21,29	7	24.14	15	31.91

Table 8 shows that the experimental group students (44.44%) stated that there was no negative aspect of the fun book. On the other hand, the control group students (34.48%) stated that the most negative aspect of the fun book was that it was very strenuous and caused hand pain. In general, it is understood that 31.91% of all students stated that there is no negative aspect of fun book. Apart from these data, the content analysis quotations of the categories are presented below.

Category 1 Very Tiring and Hand Pain

In this category, it is stated that the fun book is strenuous and that it hurt the hand. Random excerpts from both groups are given below.

The negative side of the fun book is that it is very tiring (EG1). The fun book makes us do extra work (EG9). Our hands are getting tired (CG16). The writing in the fun book is very tiring (CG20). It hurts my hand (CG23: 24).

As it is understood from the quotations, it is understood that the participants stated that the use of the fun book was “*exhausting*” and that it was “*painful*” because of the constant writing. In general, it can be said that some students stated that the use of entertainment book as a negative aspect was exhausting and hand pain.

Category 2 Taking Too Much Time

In this category, it is stated that the fun book takes too much time. Random excerpts from experimental and control groups are given below.

Failure to fill due to time loss (EG2). I don't have the opportunity to study the fun book (EG6). I don't have time to play games (EG10). Dealing with exams and lessons (taking time) (CG3). It takes some time (CG15). Lose time and points when you do missing (CG19).

Excerpts show that the students did not have the opportunity to study “*other lessons*” due to their engagement with the fun book, that they did not have time to “*play*” games and that the fun book

took too “*much time*” as a “*negative*” aspect. In general, it can be said that some students thought that the fun book takes a lot of time as a negative aspect.

Category 3 No Negative Aspects

In this category, there are statements indicating that there are no negative aspects of the fun book. Random excerpts from both groups are given below: “No negative aspects” (EG5). “The downside is nothing at all” (EG17). “There is no negative aspect” (CG2: 8). “There is nothing negative about the fun book” (CG13). When the above excerpts are examined, it is understood that the participants stated that there is “*nothing*” or “*no negative*” about the fun book. In general, it can be said that a significant number of participants stated that there is nothing negative about the fun book. The findings of the research are discussed together with the literature in the discussion section.

Discussion

In this study, academic achievement of the participants was followed with two scales. The first scale is the use of crossword fun books. According to the pre-test, post-test and retention test results, the control group students were more successful than the experimental group students. Students in the control group always maintained the difference between the experimental group students and that success was evident even after the application was given. This is similar to Coşkun et al. (2012) findings in which educational games containing scientific stories positively affected academic achievement. In fact, the effect of student positive development on academic success is known (Ballo et al., 2019).

The data showed that the fun book used in the experimental study was did not increase the success of the experimental group positively. This is similar to findings from Maden (2011) who found that jigsaw games, such as crossword, do not make a significant difference in terms of academic achievement and remembering. Similarly, Aydemir (2012) also found that the use of online crossword by experimental group students was not better than the control group in terms of academic success and retention of knowledge. This situation does not match the research findings.

The second scale used to determine academic achievement is the academic achievement test. There is no academic difference between the experimental and control groups in the pretest results of this test. However, when the posttest results are examined, it can be said that the academic achievement of the control group participants is higher than the experimental group participants. Also, one month after the application, there was no significant difference between the experimental and control groups. This situation is quite significant. It can be said that the fun book used by the experimental group participants did not affect the differentiation of academic achievement. Although it has been found that because the academic success of one month after the application did not differ at the level of the groups, it cannot be said that the fun book generally has a positive effect on the academic achievement of the experimental group. Similarly, Kapıkıran and Kiran (1999) found no significant difference in academic achievement in their homework assignments. This differs from other students, such as Karataş-Özür and Şahin (2017) who found out-of-class activities positively affected academic achievement and Bozdoğan and Kavcı (2016) who found that out-of-class activities increased academic achievement in both experimental and control groups, but increased in favor of the experimental group. Finally, Akçay et al. (2014) found that multiple writing activities (such as fun book) had a positive effect on student academic achievement and concept learning. These findings do not match the research findings.

The data showed that the fun book had no positive effect on the experimental group. The interview portion of this research helped to explain this in greater detail. In the descriptive analysis, 18 students from the experimental group used the fun book while nine did not. The entire control group uses the fun book. Since the experimental and control groups were chosen randomly in the mentioned application groups, the students who did not use the fun book despite the necessity came into the experimental group. It can be said that the fact that one third of the participants in the experimental group did not use the fun book at all affected the academic achievement level. Secondly, it was determined that five students from the experimental group and three students from the control group wanted the teachers to use the teacher's book or not to drop their grades.

This is especially important for experimental group students. Because of the experiment group consisting of 27 participants in total, nine of them did not use any book and five of them used because teacher wanted. In fact, they used the books reluctantly. It is not thought that involuntary activities will affect academic achievement positively (Balkis & Duru, 2010; Ilgar, 2004). Thus, it is assumed that 14 of the experimental group students did not use the fun book. In this case, it can be said that it is normal for the experimental study to not to have a positive effect on the academic achievement. Similarly, Aybek et al. (2011) found that students' participation rate in extracurricular activities was low. Yuladır and Doğan (2009) found that although students increased their participation in homework assignments, they did this unconsciously.

When the participants' views on the fun book were questioned, the first three most commonly used statements were; *"I learn the subjects with fun"* 51.06% (f: 24), *"to learn and not to forget the issues"* 42.55% (f: 20) and *"to make repetition of fun lessons"* 40.43% (f: 19). Apart from these data, the majority of the participants used the fun book as the reason *"for using it to learn and remember the subjects"* and *"to repeat the subject in a fun way."* In addition, it can be said that some of the participants used the fun book for exam preparation, taking notes, and teachers' desire. Similarly, Ok and Çalışkan (2019) considered activities such as homework as reinforcing to help the student in not forgetting knowledge. In general, students who think and who are interested in science career have a high attitude towards science lessons (Gibson & Chase, 2002). In addition, Gedik et al. (2011) found that the students valued the fun books because they provided repetition and consolidation of homework. These findings are similar to those of a fully structured interview form.

When the positive and negative aspects of the fun book are examined, it can be said that the majority of the participants stated that the fun book provide entertainment as a positive aspect of the fun book. In was also shown that a significant number of participants preferred fun books because they provided repetition. Finally, fun books were preferred because it helped in the note-taking process. Similar to some of the above findings, Appelbaum and Clark (2001) also showed that

fun is important for motivation in science education. Gopalan et al. (2016) found a positive and statistically significant relationship between interesting, fun and entertainment and students' motivation to learn science. Çakır and Ünal (2019) emphasized that students should be given homework assignments in preparation for the exam. When the negative aspects of the fun book are questioned, it can be said that one quarter of all participants stated that the use of the fun book as a negative aspect was exhausting and hand pain. It is also available to participants who have stated that the fun book takes a lot of time. Apart from these, it can be said that a significant number of participants stated that there was no negative aspect of the fun book. Similar to the above findings, Meydanlıoğlu (2015) emphasized that students should perform significant physical activity outside of school. The findings in this study are consistent with the time emphasis in the study. As a matter of fact, students complain that homework in the fun book takes too much time.

Conclusions and recommendations

This research project found that the fun book had no positive effect on the increase of academic success. All of the randomly selected experimental and control group participants who did not use the notebook and the majority of the experimental group who involuntarily used the books were studied. The literature suggests that all participants should be motivated by the use of fun books. The research showed that the positive aspect of the fun book enabled students to learn subjects while having fun, prevented them from forgetting previously learned material, and made it easier to prepare for an exam by taking notes.

This research shows that primary and secondary reinforcements can be used primarily to motivate the learner, but that the use of the fun book has no effect on academic achievement. Moreover, the research also showed that some students claimed that fun books were exhausting as it took a lot of time to do. Other students, however, found no negative aspect of using the fun book.

Implications for higher education are linked to teacher training for how to best use fun books in their teaching practices. In higher education courses that train teachers, fun books can become a unit of study that will help the teachers learn in a fun way and will demonstrate how they

can adopt these books in their own classes. It was found that when teachers used the fun book themselves, they, like the students in this study, do not forget the subjects due to the repeating of the subject in a fun way. The research also showed that the fun book when used as an extracurricular training activity, is especially recommended for students who have learning difficulty in understanding the material and for students who are slower learners and need more time in grasping the subjects. New samples can be made regarding the effect of the fun book on academic achievement in higher education.

Finally, the research shows that while there are benefits to doing fun books, there needs to be measures taken to prevent the student from taking too much time doing the games or activities. In this context, it is recommended that the fun book should be used at home but should not be required. From a higher educational point of view, the research suggests that the university student can also be taught to use fun books voluntarily for reinforcement of material and to teach better note-taking skills. Thus, for teachers and for university faculty, it is important to not mandate the use of the fun book, that homework assignment should not be made compulsory, and that all use of assignments should be optional.

This study offers an alternative measurement tool proposal for university faculty, teachers, and candidate teachers in recognizing and adopting curricular change for teaching of science education. Fun books can be used as a scale that can be used to evaluate the process at every stage of education. Fun books offer activities for learning and enable the student to have fun while doing puzzles, jokes, acrostic, drawing, etc. The course of academic success changes with the use of the entertainment notebook. The information learned through the use of the notebook remains up to date. The unit provides a path for the small learning to be transformed into higher education with fun repetitions. Fun book can offer the opportunity to repeat what participants or students learn and to learn more permanently. Fun book can be used in all discipline levels in education, especially science lessons.

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