

## Using a Review Book to Improve Knowledge Retention

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### Abstract

This study has two primary objectives. The first one is preparation of an efficient review book including a series of activities, which will help fourth grade students exercise what they learned in the elementary science course in a year. The second objective is examination of the prepared book in the framework of student and teacher opinions. In this study, 10 classroom teachers are interviewed at the initial stage. As a result of these interviews, a significant need is determined for a review book for elementary science course, particularly. In the study, qualitative research methods, such as observation, interviews, document analysis and focus group discussion, are used. Data collection tools compose of review book for elementary science course, teacher interview forms, student focus group discussion form and forms, in which students evaluate all activities in the book. The review book prepared by the researchers consists of 38 activities. This book was applied to 25 fifth grade students. These interviews are supported with data of observation and document analysis. The obtained data are analyzed with the content analysis. The review book is considered efficient by teacher and students. This is because it can be applied within a short time and contains whole elementary science topics of fourth grade. Furthermore, teacher can specify students' prior knowledge at the beginning of the academic year and adjust the level and teaching methods in the course accordingly. It can also be used effectively throughout the term.

**Keywords:** retention of knowledge, review book, elementary science course

### 1. Introduction

Students acquire new knowledge in many different disciplines throughout their education. However, a large part of this information is forgotten for various reasons. Among these are failure in relating the knowledge acquired with the daily life adequately, shortcomings in the teaching-learning methods and not making regular exercises (Reynolds & Glaser, 1964; Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013). Acquiring new knowledge is as important as its permanence (Banođlu & Peker, 2012). Therefore, permanence of knowledge was investigated in many studies (Ausubel & Paul, 2000; Polat, 2013; Kobal, Şahin, & Kara, 2013; Özbudak & Özkan, 2014; Seçkin-Kapucu, 2014). For instance, Ebbinghaus, who made the first systematic studies on memory, formed a "forgetting curve" starting from the results he achieved (Ornstein, 1988).

Ebbinghaus revealed in the forgetting curve that forgetting is intensive at the beginning, followed by a decreasing trend over time. In this case, methods are necessary in order to increase permanence of learned knowledge. One of the most important methods is frequently performed exercises and reviews. Permanence of knowledge dramatically increases by exercising the learned knowledge regularly (Conway, Cohen, & Stanhope, 1991; Reynolds & Glaser, 1964).

Thorndike also underlined the role of reviewing in learning. One of the three basic laws in Thorndike's Bond Theory is exercise for reviewing (Arı, Üre, & Yılmaz, 1999). According to Thorndike, reviewing is one of the measures that may provide some improvement in strength of the bond (Cihangir-Çankaya, 2011). Bandura states that mental and physical exercise makes it easier to remember the behavior taken as a model in the social learning theory (Kalkan, 2011). In the Information Processing Theory, importance of review and exercise are underlined for transferring knowledge into long-term memory. According to this theory, number of exercises strengthens the knowledge in memory (Senemođlu, 2001; Duman, 2012). Gestalt psychologists state that exercises performed consecutively contribute to make the traces in memory more consistent and meaningful (Senemođlu, 2001).

As is seen, the concept of review for exercise is frequently highlighted in many learning theories and plays a key role in providing permanence of learning (Reynolds & Glaser, 1964; Arı, Üre & Yılmaz, 1999). Review in learning with exercises provides some benefits, such as:

- Number of reviews and progression in learning are usually directly proportional with each other (Sünbül, 2010).
- It makes it easy to complete missing topics by reviewing previous ones before learning new one, and improves the quality of education (Senemoğlu, 2001).
- Reviewing performed at regular intervals may ensure mistakes reduce over time (Arı, Üre, & Yılmaz, 1999).
- Enhances permanence of cognitive and psychomotor behaviors (Senemoğlu, 2001).
- Review contributes to connect the old knowledge in the memory with the new ones (Duman, 2012).
- It eases transfer of learned knowledge to new situations (Senemoğlu, 2001).
- Review enhances permanence of learning. Moreover, it supports acquiring and strengthening of concepts and skills (Sünbül, 2010).

Teachers are expected to include frequent reviews into their courses due to the mentioned benefits of it. However, it is unclear to what degree teachers perform reviews systematically for the learned knowledge, while the importance of it, is so clear. On the other hand, another problem to be investigated is to what degree teachers have the material and time to be able to perform the expected reviews and exercises (Elmas, Öztürk, Irmak, & Cobern, 2014).

This work was originated from a needs analysis research. Following interviews with the teachers, it was determined that they need a review book, by using which they can review previous year's topics. Therefore, aim of this study is preparation of an efficient review book including a series of exercises, which will help fourth grade students practice what they learned in the elementary sciences course in a year at the end of fourth grade or at the beginning of fifth grade. Review book can be also used throughout the year in congruence with the upcoming science topics in the curriculum.

## **2. Method**

### *2.1 Research Design*

This research is qualitative in nature and is conducted in the framework of phenomenology design. Methods such as observation, interviews, document analysis and focus group discussion are used in the study. Thus, it is intended to increase the reliability of the study by ensuring triangulation (Patton, 2002; Yıldırım & Şimşek, 2013).

### *2.2 Collection and Analysis of Data*

At first, 10 classroom teachers, working in different institutions in the province of Afyonkarahisar, are interviewed in order to examine their opinions and suggestions about the elementary sciences course. The form, used in these interviews, is adapted from the interview schedule developed by Elmas et al, 2014. Field notes, which include data for teachers' expression and behavior, are taken by the researcher during interviews. Data obtained from these interviews and field notes are analyzed with the content analysis. Sentences are determined as unit of analysis. According to one of the findings of these interviews, most of the participants (8 out of 10 participants) need supplementary resources similar to the review book, which is the subject of this study. Within this period following the needs analysis, efforts are in progress in order to develop a review book.

The relevant fields, various resources (textbooks, exercise books, sheet tests, etc.) and curriculum of fourth grade elementary sciences course are analyzed, and the review book for Elementary Sciences Course is prepared in draft, which consists of 38 activities. Expert opinion is taken to have the draft book reviewed by five classroom teachers and an elementary science teacher. Gender and seniority of the experts were given in Table 1.

Table 1. Personal characteristics of experts

No	Gender	Major in Teaching	Seniority
1	Female	Classroom	11
2	Female	Classroom	14
3	Male	Classroom	7
4	Male	Classroom	8
5	Male	Classroom	11
6	Female	Science	2

The required arrangements are made on 13 activities (1, 6, 7, 8, 9, 10, 13, 16, 22, 23, 31, 32 and 33rd activities), which are required to be revised within the framework of feedbacks received from teachers. There has not been a change in the number of activities following this operation. As such, the review book consists of 40 pages. Types of activities, along with their numbers, included in the review book are given in Table 2.

Table 2. Type and number of activities included in the review book

Type of Activity	No of Activity/Activities	Total
Matching	4-5-14-18-20-32-34-35	8
Puzzle	2-3-11-15-22-25-30-36-37	9
Gap-Filling	1-13-26-33	4
Concept Map	6-27	2
Painting Demanding Activities	7-8-16-17-19-23-31	7
Multiple-Choice Questions	9-10	2
Structured Grid	12	1
True-False	21-24-38	3
Classic Question and Answer	28	1
Diagnostic Tree	29	1
	Sum Total	38

A sample exercise was given from the review book below in Figure 1.

## ETKİNLİK 1 (Activity 1)

İskeletteki kemiklerin isimlerini uygun olan kutucuğa yazalım.  
(Please write the names of the bones in the skeleton)

**Kemik çeşitleri** (Types of Bones)

(Flat Bones)

YASSI KEMİKLER	KISA KEMİKLER	UZUN KEMİKLER
(Short Bones)		

(Long Bones)

(Skull, Ribcage and Hib bones)

Kafatası, göğüs kafesi ve kalça kemikleri

(Arms and legs)

Kollar ve bacaklar

El ve ayak bilekleri, omurlar

(Wrist, ankle and vertebrae)

Figure 1. Sample exercise

A student evaluation form is also found in the review book in order to evaluate all activities according to students' opinions. Objective in this part is evaluation of each activity in terms of benefit and fun. Concerning benefit, students are asked to what degree the activity is beneficial; and concerning fun, they are asked to what degree the activity is entertaining. An example of student evaluation form is given in Table 3.

Table 3. Student evaluation form for each activity

<b>1. EXERCISE</b>	<i>Are you having fun while doing this activity?</i>									
	Bored <span style="margin-left: 200px;">Somehow Fun</span> <span style="float: right;">Fun</span>									
	1 Point ☹️	2 Point	3 Point	4 Point	5 Point 😊	6 Point	7 Point	8 Point	9 Point	10 Point 😊
	<i>Do you find this activity beneficial for your science achievement?</i>									
	Not beneficial <span style="margin-left: 100px;">Somehow beneficial</span> <span style="float: right;">Absolutely beneficial</span>									
	1 Point ☹️	2 Point	3 Point	4 Point	5 Point 😊	6 Point	7 Point	8 Point	9 Point	10 Point 😊

Following the first arrangements made, the book was color printed and implementation phase was started. According to Yıldırım ve Şimşek (2013), proximity of the researcher to data source is one of the measures that can increase the effectiveness. Therefore, this study was conducted in an elementary school, where one of the researchers spend enough time to gain trust. The practice school is at a district of Afyonkarahisar in low socio-economic level. The elementary science teacher participating in the study has a 2 year experience of teaching. The review book was applied to 25 fifth grade students, who are the students of aforementioned school. Students' age and gender are given in Table 4. Implementation of the review book lasted 8 hours in total. During the implementation, one of the researchers and the elementary science teacher stood ready at all times, thus gave guidance to students when needed.

Table 4. Participants

	Female	Male
Gender	14	11
	10 Years old	11 Years old
Age	4	21

Observations were made and field notes were taken by the researcher during implementation of the review book on students. In the field notes, observations about student and teachers' behavior, misconceptions of students, activities they have difficulty in, etc., were noted. Some of the photos taken during implementation of the review book is given in Figure 2.



Figure 2. The application of the review book

Following the implementation; opinions and suggestions of the elementary science teacher are taken about the review book. Teacher interview form consists of three themes. Questions and sub-questions are placed under the appropriate theme titles out of implementation, evaluation of the activity and evaluation of the book respectively. Upon request of the elementary science teacher, no face-to-face interview was conducted but an interview form was given to be completed in an adequate period of time (two days). In the meantime, communication with the teacher was not interrupted. It is aimed to avoid the potential drawbacks with this practice. Expressions in the form filled by the teacher are analyzed with the content analysis and coded by two researchers independently. The encodings are compared, and agreed and disagreed cases are determined. Result of reliability calculation regarding the encodings is found to be around 90% (Miles & Huberman, 1994). At the end of the meetings held, the disagreed cases are minimized and a joint code list is prepared (Table 5).

Table 5. An example of the process of how to generate an agreed code

Theme	Unit of Analyses	Coder	Code	Agreed Code	Explanation
Implementation	Teacher: "I do not have any idea regarding any student but after the application of the review book I have chance to understand their science knowledge level and their attitudes toward the course."	1	Student Readiness	Student Readiness	Student readiness is a code which also in some manner includes course attitude
		2	Course Attitudes		
Evaluation of the activity	Teacher: "Activities have plenty of visuals."	1	Too many Visuals	Visual Abundance	This is a positive comment but the first code as though has some negative meaning in it.
		2	Visual Abundance		
Evaluation of the book	Teacher: "While applying the book, I determined some misconceptions which various students have in some science concepts, which gives me an advantage before starting the term."	1	Determination of Misconceptions	Determination of Misconceptions	First code is more specific than the other one and explains the specific gain from the book.
		2	Teacher Preparation		

A focus group discussion is performed in order to take students' opinion and suggestions about the review book. The focus group discussion form consists of three themes. Questions and sub-questions are included in these three themes: the implementation of the review book, the activities in the book and general evaluation of the book, respectively. Participants of focus group discussion consist of six students who practiced with the review book. Students are grouped as low (participants are coded as D1-D2), intermediate (O1-O2) and high (Y1-Y2) according to grades of elementary sciences course and teachers' opinions. In this way, it is aimed to ensure maximum variation in sampling (Patton, 2002). Video records of the focus group discussion were taken. Transcription of the relevant sections of these records is taken, and then obtained data is analyzed. The obtained codes are placed under the appropriate theme titles. Some sample codes are presented in Table 6.

Table 6. An example of agreed code list

Theme	Unit of Analyses	Code	Result
Implementation	Teacher: "Review book provided them an opportunity to revise all topics of last year in a very short time."	Time Saving	Applying the review book in a short time can be seen as an advantage
	Student: "Review book helped us to revisit what we learn last year"	Reviewing Knowledge	Review book supported students to remember topics which they learned previous year.
Evaluation of the activity	Teacher: "... making the review with the fun activities makes them more permanence."	Knowledge Permanency	Teacher thinks that if the activities are more interesting and fun, students might have more knowledge permanence.
	Student: "I especially like the activity which is related to our body."	Concrete Experience	Students think that if the activities are more from their nearby context, they will find them more interesting and fun.
Evaluation of the book	Teacher: "Early determination of students' weak science concepts can be helpful for further classes."	Determination of Weak Concepts	Teacher thinks that determination of the superficially learned concepts at the beginning of the term is an advantage.
	Student: "I want multiple choice type questions and activities more."	Multiple Choice Type	Students are used to confront with this type of questions regularly because of this they have an incline to see and do that kind of activities which includes this type.

Another data collection method in the study is document analysis. The field notes taken by the researcher and the review books of the students participated in the focus group discussion is analyzed thematically.

### 3. Results

#### 3.1 Results of Application Theme

Objective of the questions asked in this theme is to investigate a) to what degree teacher and students think the science review book is beneficial and entertaining, b) the activities they have difficulty in. Results of this theme are therefore given under two sub-themes.

##### 3.1.1 Benefit and Fun Sub Theme

The teacher answered the question asked in benefit sub-theme as follows.

“It brought considerable benefits both for me and the students. It helped students review the previous year’s topics within a short time after a long vacation.”

The teacher thinks that implementation of the review book within a short time and its containing all topics of fourth grade education is a positive issue. It’s also possible to use within scope of the topics throughout the year. Therefore, briefness and content of the review book can be considered appropriate.

“... it also helped me understand students’ level and their attitudes towards the course, as I have not get acquainted with them yet.”

The teacher finds the review book beneficial also for himself. It can be deduced from the field notes that teacher communicated with the students in a positive manner in the last two days of the study. In short, the review book gave them a chance to get to know each other better. Furthermore, these situations show that the review book, with this function, may strengthen the communication between student and teacher at the beginning of the academic year.

In the focus group discussion performed with the students, some of the students answered the question of to what degree they found this book helpful, as follows.

“We reviewed the previous topics we learned (Y1).”

“That reminded us what we have forgotten (O1).”

“It prepared us for the fifth grade (Y1 said this and O1-O2-D1 supported.)”

Students think the book is mostly helpful in terms of preparation, exercise (review) and reminder of forgotten. Shortly, students are aware of the fact that exercising of foreknowledge may help in learning of future topics (Senemoğlu, 2001). Arithmetic mean of book’s benefit dimension is found to be 8.3 (over 10), when the student activity evaluation form is analyzed. This value supports the situation that students, in general, find the review book beneficial.

The student O1, unlike the others, answered this question as “It was a little helpful”. When the researcher asked the student why he considered it a little helpful, he answered as “Some of the activities was difficult so I asked for help from the teacher during those activities”. It means that students think the activities has difficulty in are not beneficial for him. Success of the student in the review book does not match exactly with his expressions. However, student’s expressions reveal that guidance of teacher is substantial in implementation of the review book.

The elementary sciences teacher answered the question concerning fun dimension of the book as follows.

“I think students, in general, have fun with the review book. I was happy because students were happy in the course.”

It is understood from the above expression that teacher has fun with the review book. It can be seen from the field notes that there is not any discipline problems in the class during implementation. One of the reasons for why the teacher had fun with application of the book may be this mood of optimism in classroom management. Therefore, it can be thought that the review book, with this function, excited students’ interest in the science course, particularly after a long vacation, and thereby minimized the discipline problems.

In addition, the students answered the question concerning fun sub-dimension as follows.

“We both had fun and learned (D2)”

“I learned structure of our body (Y2)”

“I enjoyed painting (O2).”

With taking into account the above expressions, it can be considered that students, in general, found the book entertaining. Students explain why they had fun with the exercising book by underlining the activity types. Therefore, it can be said that excessive number of activities contributed to their having fun with the book. Arithmetic mean of book's fun dimension is found to be 7.97 (over 10), when the student activity evaluation form is analyzed. This value supports the above result.

### 3.1.2 Difficulties Encountered During Implementation Sub Theme

The teacher answered the question concerning this sub-dimension, as follows.

“It would be more helpful if the instructions of 5-6-8-29th activities were a little more descriptive.”

It is understood from the field notes that a number of students (about 5 of 25 students) asked questions at the teacher and researcher without reading instructions of the activities carefully. One of the measures that can be to resolve this unfavorable situation may be revision of the instructions. Developmental level of students was taken into account while preparing the activities. Furthermore, instructions were examined by six teachers. However, it would be useful to make some changes on the instructions, when under achievement of the practice school at common exams is considered. For instance, instructions can be shorter and written in larger fonts.

Students concentrated mostly on the 29th activity, while answering the question related with this sub-dimension. It is seen from the field notes that the students asked questions mostly related with the 29th activity. This will be addressed in activity evaluation section in more detail. Another subject suggested by the students is they did not have the necessary color (e.g. Activity 31) when performing some activities. In addition, it is seen from the field notes that students had difficulty in having access to some colors (pink and purple). Actually, it is an unanticipated situation that the low socio-economic level would give such an effect. For this reason, if such a review book would be used in schools at districts with a low socio-economic level, it is important to prepare the color spectrum used in the activities by taking into account the most used colors.

### 3.2 Results of Activity Evaluation Theme

In this theme, teacher is asked to evaluate the activities in terms of images, student level, clarity, efficiency, and give suggestions. The teacher answered these questions as follows:

“It was rich in images. This has made the study more entertaining. Activities were appropriate for student levels. However, minor changes can be made in a number of activities. Moreover, I think it would be more lasting to perform the exercises with entertaining characteristics.”

It is understood from the above expressions that the teacher found the review book adequate in general in terms of visual quality, compliance with student level and efficiency. The notable expression from the point of efficiency is “entertaining activity”. At the previous theme, it was inferred that the teacher found the book entertaining just because students had fun with it. Therefore, results obtained from both themes support each other concerning fun. According to the teacher, students having fun with the review book may improve permanence. Teacher answered as follows when asked to evaluate in detail.

“Students somewhat hesitated when they attend the fifth activity. Perhaps, images/figures of this activity may be larger.”

“In the sixth activities, they had difficulty in answering because we did not use the concept map in a widespread manner.”

“The eighth activity should be made a little easier.”

“They had difficulty in answering in 29th activity because we did not use the diagnostic tree commonly.”

Fifth activity of the review book is a matching style activity. The teacher asked for magnifying the images in this activity. When efforts of the students in the review book are analyzed, it is found that only two students (O2-D2) gave completely wrong answers in this activity. Success of students in this activity conflicts with teacher's opinion. However, large size of images of the activities in the review book is also one of the most important issues to be considered.

Sixth activity is a concept map. Teacher emphasized that they did not lay emphasis on this type of activities in their courses. Students indicate in focus group discussion that they confronted with the concept map less often. When efforts of the students in the review book are analyzed, it is found that only one student (D2) gave completely wrong answers in this activity. This shows that students can overcome this type of activity although concept map is not used adequately in elementary sciences course. General structure of the body and important organs are included in this activity. The same topic was learned in the first activity, which was found most



helpful by the students. This strengthens the perception that students had challenges at this activity because the concept map was not used in a widespread manner.

Teacher suggests making the eighth activity a bit easier. As mentioned previously, curriculum was taken into consideration while preparing the activities and six teachers evaluated the activities individually. In those evaluations, it was generally accepted that difficulty level of the activities is appropriate for fourth grade students. At this point, studies should be performed on why students had so much challenges with the topic mentioned in the eighth activity and what type of deficiencies exist in teaching of this topic. The topic, which is emphasized in the eighth activity, is specification of physical and chemical changes in the substance. If this subject is not taught effectively, misconceptions may appear with the students (Pella & Voelker, 1967; Hesse & Anderson, 1992).

29th activity includes diagnostic tree (DT). Teacher admits he did not include DT adequately in the course. Students asked questions mostly in this activity (DT), while implementing the review book. Furthermore, it is specified that all of the students gave wrong answers to DT when the review books were analyzed. Students having encountered with DT less often may be the case in this situation. Importance of variety of tools used in the course becomes clear at this point. Students encountering various tools stagger at first step. On the other hand, the environmental pollution topic dealt with at the activity might also be effective in this negative result. This is another subject, which if not taught effectively, misconceptions may appear again in students (Demirbaş & Pektaş, 2009; Yardımcı & Bağcı-Kılıç, 2010).

When the activity evaluation form is analyzed, it was found that students had less fun with the 29th activity (whose arithmetic mean is 5.7 over 10) and found the activity less helpful (whose arithmetic mean is 6.5 over 10), similar to the result found above. When the students were asked the reason for this, some of them answered as follows.

“I found the image somewhat complex (D2).”

This expression supports the fact that students have encountered with DT less often. It would therefore be more favorable to include DT in the courses, more frequently.

It is determined in student evaluation section that students had fun mostly with 25th activity (whose arithmetic mean is 8.8 over 10). Some of the students explained the reasons for this situation in the following way.

“My teacher, it is better to have more puzzles (O2).”

“I love puzzles (Y2).”

Students reported that they got more pleasure from puzzle. This expression shows that including puzzles in the review book was found to be positive.

In activity evaluation section, it is reported that the first activity was the most beneficial activity. Some of students explained the reasons for this situation with the following sentences.

“It is beneficial because it relates to our body (Y2)”

“I had forgotten because it was the first topic we learned last year (D1).”

From these expressions one understands that this topic is the most forgotten one and should thus be reviewed. In addition, students deem it more beneficial since it is related with the human body. It is seen from the analysis of the review books that students were generally successful in this activity. The reason of success of students in this activity can be found in activity evaluation section and discussion data, which are in harmony. In summary, students find it beneficial to have activities associated with everyday life included in the review book.

### *3.3 Evaluation of the Book*

The teacher's opinion related with this topic is taken in two dimensions. These are attitude and effect on the overall success of the course. The following is answer of the teacher to the attitude dimension.

“Activities were entertaining. Therefore, the book may provide favorable development in attitude of the students towards the physical sciences course.”

According to the teacher, students having fun from the activities may affect their attitude towards the course.

The teacher answered the question related with the overall success of the course, as follows.

“Determining the deficiencies of students, and, in particular, starting the new topics after specifying misconceptions may increase success in the course.”

It is understood from these expressions that the teacher considers the review book will contribute to students' attitudes and course success. Furthermore, the teacher recommends that deficiencies of students should be

determined and some measures should be taken, following implementation of the review book.

In addition, the students answered the questions related with this theme, by listing their suggestions.

Some of the students' expressions are given below.

"There should be more multiple-choice questions (Y1-Y2)."

"Gap-filling should be increased (O1)."

"More matching we want (D2)."

"Figures should be included (Y1-Y2-O2-D1-D2)."

"Puzzles were good (All of the students)."

From the above expressions, it seems that students have more fun from activities, such as puzzle, matching, gap-filling. However, the notable words are tests and questions. Students with high levels of success desire to have number of multiple-choice questions increased in the review book. It is understood from the interview forms that these students answer mostly this type of questions, while studying and courses. It is seen that the multiple-choice questions, the most frequently used format, adapted the students to this question format and they had difficulty in answering the question formats other than those. In particular, choosing this format in common exams due to its high objectivity makes the students more addicted to multiple-choice format and this may cause them to be restricted in terms of high-level thinking skills. It is an important issue to assess particularly primary education students through different type of activities and question formats, with which they are able to express themselves.

#### 4. Discussion

With the results obtained from this study, elementary science teacher and students generally consider the review book beneficial because it provides opportunity of reviewing previous year's topics and reminding what they have forgotten. Similar studies in the literature also support this evidence. For instance, Atik-Kara and Kürüm-Yapıcıoğlu (2013) prepared various worksheets, including also puzzles, in order to strengthen the learning process. In their work, they found that the worksheets were beneficial for the participants because they gave the opportunity for exercising of what was learned. In addition, Ormancı and Şaşmaz-Ören (2010) reported that the worksheets prepared in a similar manner were found useful by most of the participants because they also provided a way for exercising of what was learned.

The elementary sciences teacher underlined at the interview that the students had fun from the review book and this may contribute to their attitudes towards the course. Students also stated they found the review book generally entertaining. Variety of activities in the review book is also effective on students' having fun from the study. Worksheets including different activities, such as figure, puzzle, concept cartoons, were found entertaining by the students (Atasoy, Akdeniz, & Başkan, 2007). It is determined in also observation data that the teacher did not have difficulty in managing the classroom, which is consistent with these results. The review book may have contribute to this result because activities, which may attract students' attention and ensure them to have fun, are one of the factors that make classroom management easier (Satoğlu, 2008).

Furthermore, it is inferred from the study that students found DT less beneficial and entertaining. Data, which is obtained from document analysis, discussions with the teacher and observations, also supports this situation. As mentioned in the previous section, including this type of activities in science courses less often may be one of the reasons for this to occur. Various studies in literature (Büyüktokatlı & Bayraktar, 2014; Sağlam-Arslan, Devocioğlu-Kaymakçı, & Arslan, 2009) also emphasize that DT is not included in elementary science course adequately. Including DT in the review book may contribute to resolve this problem. Moreover, the teacher participating in the study also stated that they did not use DT commonly. Similar to this data, Şenel-Çoruhlu, Er-Nas and Çepni (2009) also specified in their studies that teachers need in-service training with respect to DT.

Students participating in the study found the puzzles in the review book mostly beneficial. It is specified in several studies (Yıldırım & Somuncuoğlu, 2010; Atik-Kara & Kürüm-Yapıcıoğlu, 2013) that students get pleasure mostly from the puzzle activity. Büyüktokatlı and Bayraktar (2014) revealed that teachers included puzzles in their courses more often than the other activity types. Therefore, it seems that students consider the activities they are used to more beneficial and entertaining. In summary, students may get less pleasure from the activity types which they are not used to and do not know adequately.

By taking into account the above data, it's understood that the course book provided the desired overall effect. Also, the review book was shared with its final form following mini meetings with teachers and students, and participants' confirmation was received after taking their opinions (Yıldırım & Şimşek, 2013). Following this, no

change was made in the activities and the number of pages of the review book.

## 5. Suggestions

Science teachers have better chance to learn about their students' characteristics and make communication with them, while implementation of the review book. Performing studies, such as this, students have fun from the beginning of the academic year may therefore strengthen the student-teacher relationship. Students' opportunities were taken into consideration in the study. However, economic conditions of the settlement where the book was applied were effective in that some of the students could not achieve to find a number of materials (such as paints in some colors). Therefore, considering this situation may be useful in a similar study. Instructions in the review book should be written more clearly. Furthermore, instructions should be examined by the teachers. However, it is inferred from the study that some of the students did not understand the instructions, as they did not read them carefully. Therefore, it would be more beneficial to write shorter in larger fonts.

It is inferred from the study that students found DT less beneficial and entertaining. Therefore, it may be more useful to use the activities, such as matching, fill in the blanks, DT, concept map and structured grid, in the courses more often. In this way, students may look from a different perspective and courses may be pulled away from the multiple-choice routine. Activities are associated with everyday life and this has an effect on students' finding the review book useful, which is inferred from the study. Therefore, it may be useful to associate the activities with everyday life to a certain extent in a similar study.

At the end of the study, it seems that student and teachers found the review book generally useful and entertaining. A similar review book may be prepared at other grade levels and for different courses. In addition to this, using review book within the scope of the curriculum throughout the year may support retention of knowledge more than one shot application (Rohrer, 2015). This helps to distribute the effect throughout the term or year.

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