Effect of Augmented Reality-Based Reading Activities on Some Reading Variables and Participation in Class*

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Abstract

The aim of this study was to examine the effect of augmented reality-based reading activities on reading comprehension, reading motivation, attitude towards reading and class participation of fourth grade elementary students, and to obtain the students' views regarding this. The research was conducted with 54 fourth grade students attending two different classes of a state school with a medium socioeconomic level located in the city centre of the province of Kars during the autumn semester of the 2018-2019 academic year. The quantitative dimension of the study, in which a sequential explanatory mixed design was used, was carried out with a quasi-experimental design with pretest-posttest control group. In the qualitative dimension, however, opinions were obtained by means of semi-structured interviews following the implementation. The semi-structured process lasted for a total of 7 weeks, including a 1-week awareness programme and a 6-week implementation, and during this period, the implementation, which was related to augmented reality-based reading exercises, was carried out with the experimental group. In the control group, however, instruction based on the standard Turkish subject curriculum was carried out. The findings obtained from the quantitative dimension of the study revealed that there was a significant difference between scores of the experimental and control groups in reading comprehension, attitude towards reading, reading motivation and class participation, in favour of the experimental group. Moreover, in the qualitative dimension of the study, the interviewed students in the experimental group generally expressed positive views related to the augmented reality-based reading exercises. The students stated that they were able to use augmented reality easily, and that it had real-like, three-dimensional, entertaining and participative features. Furthermore, the students reported that as well as reading comprehension and reading attitude, it had an effect on their thinking skills, academic development and communication skills.

Keywords: Augmented Reality, Reading Comprehension, Reading Motivation, Reading Attitude, Class Participation

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INTRODUCTION

Reading is a complex process that influences an individual's life and enables him to acquire intellectual, cultural and social competence (Keskin, 2012). A good reader is an individual who can use his prior knowledge, who recognises sounds and words, who can read strategically and fluently, who has positive sensory characteristics and vocabulary, and who can achieve comprehension (Zipke, 2007). Comprehension, which is one of the variables that affect the reading process, is the fundamental point on which the reading process is focused (Ülper, 2010, p.4), since the aim of reading is to grasp the meaning given in the text (Gunning, 2008, p.1). A reader with well-developed comprehension skill identifies the aim and topic of the text that he reads, knows the meanings of words, finds the main and supporting ideas, and reaches conclusions (Güneş, 2000). For individuals to be able to realise these skills, they need to possess a positive attitude towards reading (Wang, 2000). Students' reading attitudes affect the time they spend reading and the development of their reading skills (Martinez, Aricak & Jewell, 2008). Another affective variable, which is as important as attitude in the reading process, is motivation (Baker & Wigfield, 1999). Since reading is an optional activity, it requires motivation towards reading besides sufficient mental ability, otherwise, time will not be set aside for reading (Wigfield, Guthrie, Tonks & Prencevich, 2004). Class participation, which is one of the concepts that helps students to be successful and enables development of academic skills, can be stated as the student's active engagement in learning activities (Skinner, Kinderman & Furrer, 2009). Class participation is an important indicator of student achievement (Handelsman, Briggs, Sullivan & Towler, 2005). Therefore, researchers work on ways and means to increase students' participation in class.

The methods and materials that teachers are to use to develop reading skills in the elementary school period are important. While the teacher is selecting the method or materials that he will use in class, he must follow technological and scientific developments, place the student at the centre and pay attention to individual differences. In enabling individuals to love reading and display a positive attitude, the inclusion of technology in reading activities is one of these methods (Papatğa, 2016). In this sense, one of the new technologies that can be used in different ways in education environments is Augmented Reality.

Augmented Reality (AR) is the direct or indirect appearance in real time of a real environment that has been enhanced by the addition of computer-based information (Wasko, 2013). In augmented reality, images, data or three-dimensional objects are added simultaneously to a video image of a real environment prepared as the background (Billinghurst, Kato & Poupyrev, 2001). AR offers three-dimensional learning content and assists in permanent and effective learning (Wu, Lee, Chang, & Liang, 2013). AR, which is suitable for a structured learning approach, not only assists in concretisation of abstract concepts (Walczak, Wojciechowski & Cellary, 2006), but also enables learning by doing and experiencing (Singhal, Bagga, Goyal, & Saxena, 2012). In particular, AR enables interaction between real and virtual objects, increases attention and motivation, and aids participation in class (Singhal, Bagga, Goyal & Saxena, 2012).

When studies conducted in the field of education are examined, it is seen that there are numerous studies on the subject of the positive effect on AR on learning, especially when used in subjects such as science, geometry, mathematics and history (Abdüsselam, 2014; Akçayır, 2016; Erbaş, 2016; Yıldırım, 2018). Within this scope, the insufficient number of studies conducted in the area of reading is regarded as a deficiency and it is considered that the present study will contribute to the field. The aim of the current study is to examine the effect of augmented reality-based reading activities on reading comprehension, reading motivation, attitude towards reading and class participation of fourth grade elementary students, and to obtain the students' views regarding this. In line with this main aim, answers were sought to the following questions in the quantitative dimension of the sequential explanatory mixed design:

1. Is there a significant difference between pretest and posttest scores for "reading comprehension", "reading motivation", "attitude towards reading" and "class participation" of students in the experimental group with which augmented reality-based reading activities were applied?

2. Is there a significant difference between groups in terms of posttest scores when pretest scores for "reading comprehension", "reading motivation", "attitude towards reading" and "class participation" of students in the experimental group with which augmented reality-based reading activities were applied, and students in the control group with which instruction based on the Turkish Subject Curriculum was applied, have been brought under control?

In the qualitative dimension of the sequential explanatory mixed design in the research, answers to the following question were sought:

3. What are the views of students in the experimental group related to augmented reality-based reading activities?

METHODOLOGY

Research Model

In this study, since the aim was to determine fourth grade elementary students' levels of reading comprehension, reading motivation, reading attitude and class participation, the quasi-experimental model of quantitative research methods was used. Besides the quantitative data obtained from this model, the qualitative section of the study was carried out with the interview, which is one of the qualitative data collection tools, and therefore, the sequential explanatory model, which is one of the mixed research methods, was used. The sequential explanatory mixed model involves collection and analysis of quantitative data, followed by collection and analysis of qualitative data (Hanson, Creswell, Clark, Petsa & Creswell, 2005).

Study Group

Study group of quantitative dimension of research

The study group of the quantitative dimension of the research consisted of 54 fourth grade students attending two different classes of a state school with a medium socioeconomic level located in the city centre of the province of Kars during the autumn semester of the 2018-2019 academic year.

Study group of qualitative dimension of research

The study group of the qualitative dimension of the research was made up of a total of 26 fourth grade students (14 girls and 12 boys) in the experimental group who took part in augmented reality-based reading activities over a period of 7 weeks, which included a 1-week awareness programme and a 6-week actual implementation.

Data Collection Tools

Data collection tools related to quantitative dimension of research

Reading comprehension test

Two reading comprehension tests, a pretest and a posttest, were developed by the researchers in order to measure students' reading comprehension skills (Çetinkaya Özdemir & Akyol, 2019). For

the reading comprehension test, multiple choice-type questions suitable for fourth grade with four options were used.

Elementary reading attitude survey

To measure the students' attitudes towards reading in the study, the *"Elementary Reading Attitude Survey"* (ERAS) developed by McKenna and Kear (1990) and adapted for Turkish by Kocaarslan (2015) was used.

Motivation to read questionnaire

To determine students' reading motivation in the study, the *"Motivation to Read Questionnaire"* (MRQ) developed by Wang and Guthrie (2004) and adapted for Turkish by Yıldız (2010) was used.

Student course engagement questionnaire

To determine students' participation in the Turkish class, the *"Student Course Engagement Questionnaire"* (SCEQ) developed by Handelsman et al. (2005) and adapted for Turkish by Gürer (2013) was used.

Data collection tools related to qualitative dimension of research

Semi-structured interview form

In order to reveal the views of students in the experimental group related to the augmented reality-based reading activities that were carried out, a semi-structured interview form was prepared by the researchers. While the form was being prepared, a review of the literature was made, and the interview questions were created in accordance with this. To determine the appropriateness of the questions for the aim of the research and the target group it would be applied to, and to test the clarity of the questions, the views of 5 specialists with expertise in qualitative research were consulted, and the form was revised accordingly. Then, the draft form was applied to 2 students who were in fourth grade of elementary school, revisions were made to unclear questions, and the form was given its final shape.

Data Collection

The data collection process of the research was carried out in two stages, quantitative and qualitative, during the autumn semester of the 2018-2019 academic year. In the quantitative dimension, before the quasi-experimental implementation was carried out, the *"reading comprehension pretest"*, the *"elementary reading attitude survey"*, the *"motivation to read questionnaire"*, and the *"student course engagement questionnaire"* were applied to the fourth grade students in the experimental and control groups. The scores obtained by the students from this application were accepted as the "pretest". Before beginning the implementation process, the students in the experimental group were given a one-week awareness programme related to the activities. Following this awareness programme, the six-week implementation was carried out. During the implementation, the lessons were conducted with informative and narrative texts and presented to the students via activities in which AR technology was used. Visuals and videos suitable for the use of AR technology were incorporated into the activities, which were prepared to suit the primary school Turkish Curriculum. For each text, intended as both informative and narrative texts, 8 activities were prepared. An attempt was made to eliminate deficiencies by obtaining expert opinions about the prepared activities. While students in the control group were required to continue their Turkish lessons with the fourth grade elementary Turkish coursebook which included two-dimensional pictures, students in the experimental group used a book designed by the researchers, which included three-

dimensional multimedia materials embedded within activities that were considered necessary and were based on exercises in the Education Ministry's fourth grade coursebook in line with the elementary Turkish Curriculum. While the book used as course material was being designed, activities were prepared by the researchers according to the selected texts. The three-dimensional multimedia materials suitable for augmented reality that were incorporated into the activities were also prepared by obtaining the assistance of a computer engineer who is a specialist in this field. The final checks of the designed book were made by the designer and researchers, and missing or inaccurate points in the pictures and videos included in the book were corrected. The quasi-experimental implementation was presented via tablet computers with the mobile augmented reality application that was made. Following the quasi-experimental implementation process, the test and scales used in the pretest were implemented again. This application was expressed as the "posttest". In the qualitative dimension of the study, following the implementation, students' feelings, ideas and views related to the process were obtained via the semi-structured interview form. The interviews were conducted by means of the semi-structured interview form with the 26 students who made up the experimental group. The interviews, which were held in the school's support room after lesson hours, were recorded with the permission of the students and lasted about 10-12 minutes each. The interviews began with information about the aim of the research, and students were informed that the interviews were voluntary, would be recorded and would be kept confidential. During the interviews, students were not subjected to any kind of orientation.

Data Analysis

In this study, in which a sequential explanatory mixed design was used, the quantitative data were analysed using the SPSS software program. For analysis of the data obtained during the research, first of all, descriptive statistics were calculated. In all analyses, 0.05 was taken as the level of significance. Moreover, to determine whether or not the scores showed a normal distribution, kurtosis and skewness values were taken as the basis. Since every test that was applied showed a normal distribution, the parametric tests, "t-test for dependent samples" and "t-test for independent samples", were performed.

In the analysis of the qualitative data, however, content analysis was used for analysing the data obtained. To ensure internal validity of the qualitative data in the study, expert views related to the research questions and data were obtained. In terms of internal reliability, assistance was obtained from three specialists while creating the codes and themes, and certain themes, categories and codes were amended. Moreover, using the formula proposed by Miles and Huberman (1994) for percent agreement [(P)=Number of Agreements/(Number of Agreements+Number of Disagreements)×100], a rate of 89% consensus between researchers was reached. Furthermore, an attempt was made to ensure external validity by making direct quotations from the responses given by the participants. In the direct quotations, student identity was kept confidential by using previously determined code names instead of their real names. Finally, to enable external reliability, the obtained data, the results found and the interpretations made were confirmed by an expert in the field.

FINDINGS AND INTERPRETATION

Findings Obtained in Quantitative Dimension of Study

Findings related to first sub-problem of study

Findings related to the first sub-problem of the study are expressed under four subheadings.

Comparison of reading comprehension pretest and posttest scores of students in experimental group

With the aim of determining the reading comprehension levels of students in the experimental group, the "Reading Comprehension Pretest" and "Reading Comprehension Posttest" were applied, respectively, before and after the quasi-experimental implementation. Descriptive statistical analyses related to the reading comprehension levels of students in the experimental group prior to and following the implementation are shown in Table 1.

Table 1. Descriptive Statistical Analyses Related to Reading Comprehension Levels Before and After Implementation for Students Subjected to Augmented Reality-Based Reading Activities

Reading Comprehension	N	$\bar{X}$	Std.Dev.
Pretest	26	12.57	4.45
Posttest	26	18.61	2.29

Table 2. Dependent Samples t-Test Results Related to Reading Comprehension Levels of Students Subjected to Augmented Reality-Based Reading Activities

Reading Comprehension	$\bar{X}$	Std.Dev.	Sd	t	p
Pretest-Posttest	6.03	4.83	25	6.36	.000

The dependent samples t-test results related to reading comprehension levels of students subjected to augmented reality-based reading activities are shown in Table 2. Prior to the implementation, the mean score obtained by students in the reading comprehension test was ($\bar{X}$= 12.57), and the standard deviation was (std.dev.=4.45). Following the implementation, the mean score obtained by students in the reading comprehension test was ($\bar{X}$= 18.61), and the standard deviation was (std.dev.=2.29). According to the results of the dependent samples t-test that was performed, the augmented reality-based reading activities applied to the students significantly increased their reading comprehension test mean scores ($\bar{X}$=6.03) and standard deviations (std.dev.=4.83), t(25)=6.36, p<.05 and r=0.78. It was seen that 78% of the variance in students' reading comprehension was due to the augmented reality-based reading activities. According to Cohen (1988), this is regarded as a large effect.

Comparison of reading motivation pretest and posttest scores of students in experimental group

With the aim of determining the reading motivation levels of students in the experimental group, the "Motivation to Read Questionnaire" was applied before and after the quasi-experimental implementation. Descriptive statistical analyses related to the reading motivation levels of students in the experimental group prior to and following the implementation are shown in Table 3.

Table 3. Descriptive Statistical Analyses Related to Reading Motivation Levels Before and After Implementation for Students Subjected to Augmented Reality-Based Reading Activities

Reading Motivation	N	$\bar{X}$	Std.Dev.
Pretest	26	67.73	10.08
Posttest	26	72.57	5.74

Table 4. Dependent Samples t-Test Results Related to Reading Motivation Levels of Students Subjected to Augmented Reality-Based Reading Activities

Reading Motivation	$\bar{X}$	Std.Dev.	Sd	t	p
Pretest-Posttest	4.84	11.32	25	2.18	.039

The dependent samples t-test results related to reading motivation levels of students subjected to augmented reality-based reading activities are shown in Table 4. Prior to the implementation, the

mean score obtained by students in the reading motivation scale was ($\bar{X}$= 67.73), and the standard deviation was (std.dev.=10.08). Following the implementation, the mean score obtained by students in the reading motivation scale was ($\bar{X}$= 72.57), and the standard deviation was (std.dev.=5.74). According to the results of the dependent samples t-test that was performed, the augmented reality-based reading activities applied to the students significantly increased their reading motivation scale mean scores ($\bar{X}$=4.84) and standard deviations (std.dev.=11.32), t(25)=2.18, p<.05 and r=0.39. It was seen that 39% of the variance in students' reading motivation was due to the augmented reality-based reading activities. According to Cohen (1988), this is regarded as a medium effect.

Comparison of reading attitude pretest and posttest scores of students in experimental group

With the aim of determining the reading attitude levels of students in the experimental group, the "Elementary Reading Attitude Survey" was applied before and after the quasi-experimental implementation. Descriptive statistical analyses related to the reading attitude levels of students in the experimental group prior to and following the implementation are shown in Table 5.

Table 5. Descriptive Statistical Analyses Related to Reading Attitude Levels Before and After Implementation for Students Subjected to Augmented Reality-Based Reading Activities

Attitude Towards Reading	N	$\bar{X}$	Std.Dev.
Pretest	26	29.19	6.15
Posttest	26	44.00	9.09

Table 6. Dependent Samples t-Test Results Related to Reading Attitude Levels of Students Subjected to Augmented Reality-Based Reading Activities

Attitude Towards Reading	$\bar{X}$	Std.Dev.	Sd	t	p
Pretest-Posttest	14.80	11.20	25	6.74	.000

The dependent samples t-test results related to reading attitude levels of students subjected to augmented reality-based reading activities are shown in Table 6. Prior to the implementation, the mean score obtained by students in the reading attitude scale was ($\bar{X}$= 29.19), and the standard deviation was (std.dev.=6.15). Following the implementation, the mean score obtained by students in the reading attitude scale was ($\bar{X}$= 44.00), and the standard deviation was (std.dev.=9.09). According to the results of the dependent samples t-test that was performed, the augmented reality-based reading activities applied to the students significantly increased their reading attitude scale mean scores ($\bar{X}$=14.80) and standard deviations (std.dev.=11.20), t(25)=6.74, p<.05 and r=0.80. It was seen that 80% of the variance in students' reading attitude was due to the augmented reality-based reading activities. According to Cohen (1988), this is regarded as a large effect.

Comparison of class participation pretest and posttest scores of students in experimental group

With the aim of determining the class participation levels of students in the experimental group, the "Student Course Engagement Questionnaire" was applied before and after the quasi-experimental implementation. Descriptive statistical analyses related to the class participation levels of students in the experimental group prior to and following the implementation are shown in Table 7.

Table 7. Descriptive Statistical Analyses Related to Class Participation Levels Before and After Implementation for Students Subjected to Augmented Reality-Based Reading Activities

Class Participation	N	$\bar{X}$	Std.Dev.
Pretest	26	85.46	11.45
Posttest	26	93.61	8.00

Table 8. Dependent Samples T-Test Results Related To Class Participation Levels Of Students Subjected To Augmented Reality-Based Reading Activities

Class Participation	$\bar{X}$	Std.Dev.	Sd	t	p
Pretest-Posttest	8.15	16.57	25	2.50	.019

The dependent samples t-test results related to class participation levels of students subjected to augmented reality-based reading activities are shown in Table 8. Prior to the implementation, the mean score obtained by students in the class participation scale was ($\bar{X}$= 85.46), and the standard deviation was (std.dev.=11.45). Following the implementation, the mean score obtained by students in the class participation scale was ($\bar{X}$= 93.61), and the standard deviation was (std.dev.=8.00). According to the results of the dependent samples t-test that was performed, the augmented reality-based reading activities applied to the students significantly increased their class participation scale mean scores ($\bar{X}$=8.15) and standard deviations (std.dev.=16.57), t(25)=2.50, p<.05 and r=0.44. It was seen that 44% of the variance in students' class participation was due to the augmented reality-based reading activities. According to Cohen (1988), this is regarded as a medium effect.

Findings related to second sub-problem of study

Findings related to the second sub-problem of the study are expressed under four subheadings.

Comparison of reading comprehension posttest scores of students in experimental and control groups

To determine whether there was a significant difference between reading comprehension posttest scores of students in the experimental group, who were subjected to augmented reality-based reading activities, and students in the control group, who were subjected to the standard Turkish subject curriculum, analysis was made with the independent samples t-test. The independent samples t-test analyses related to reading comprehension levels of students in the experimental and control groups following the implementation are shown in Table 9.

Table 9. Independent Samples t-Test Results Related to Reading Comprehension Levels of Students in Experimental Group Subjected to Augmented Reality-Based Reading Activities and Students in Control Group Subjected to Standard Turkish Subject Curriculum

Reading Comprehenion Posttest Scores	Group	N	$\bar{X}$	Std.Dev.	Sd	t	p
	Exp.	26	18.61	2.29			
					52	5,67	.000
	Control	28	13.28	4.36			

As can be seen in the above table, the mean score ($\bar{X}$=18.61, std.dev.= 2.29) obtained in the reading comprehension test by students subjected to augmented reality-based reading activities was higher than the mean score ($\bar{X}$=13.28, std.dev.= 4.36) obtained in the reading comprehension test by students subjected to the standard Turkish subject curriculum. The difference between the mean reading comprehension scores of students subjected to augmented reality-based reading activities and mean reading comprehension scores of students subjected to the standard Turkish subject curriculum is significant, t(52)= 5.67, p<.05, r= 0.61. The augmented reality-based reading activities explain 61% of the students' reading comprehension. According to Cohen (1988), the calculated r value is regarded as a large effect.

Comparison of reading motivation posttest scores of students in experimental and control groups

To determine whether there was a significant difference between reading motivation posttest scores of students in the experimental group, who were subjected to augmented reality-based reading activities, and students in the control group, who were subjected to the standard Turkish subject curriculum, analysis was made with the independent samples t-test. The independent samples t-test analyses related to reading motivation levels of students in the experimental and control groups following the implementation are shown in Table 10.

Table 10. Independent Samples t-Test Results Related to Reading Motivation Levels of Students in Experimental Group Subjected to Augmented Reality-Based Reading Activities and Students in Control Group Subjected to Standard Turkish Subject Curriculum

Reading Motivation Posttest Scores	Group	N	$\bar{X}$	Std.Dev.	Sd	t	p
	Exp.	26	72.57	5.74			
	Control	28	54.17	8.23	52	9.29	.000

As can be seen in the above table, the mean score ($\bar{X}$=72.57, std.dev.= 5.74) obtained in the reading motivation scale by students subjected to augmented reality-based reading activities was higher than the mean score ($\bar{X}$=54.17, std.dev.= 8.23) obtained in the reading motivation scale by students subjected to the standard Turkish subject curriculum. The difference between the mean reading motivation scores of students subjected to augmented reality-based reading activities and mean reading motivation scores of students subjected to the standard Turkish subject curriculum is significant, t(52)= 9.29, p<.05, r= 0.78. The augmented reality-based reading activities explain 78% of the students' reading motivation. According to Cohen (1988), the calculated r value is regarded as a large effect.

Comparison of reading attitude posttest scores of students in experimental and control groups

To determine whether there was a significant difference between reading attitude posttest scores of students in the experimental group, who were subjected to augmented reality-based reading activities, and students in the control group, who were subjected to the standard Turkish subject curriculum, analysis was made with the independent samples t-test. The independent samples t-test analyses related to reading attitude levels of students in the experimental and control groups following the implementation are shown in Table 11.

Table 11. Independent Samples t-Test Results Related to Reading Attitude Levels of Students in Experimental Group Subjected to Augmented Reality-Based Reading Activities and Students in Control Group Subjected to Standard Turkish Subject Curriculum

Reading Attitude Posttest Scores	Group	N	$\bar{X}$	Std.Dev.	Sd	t	p
	Exp.	26	44.00	9.09			
	Control	28	36.53	8.19	52	3.17	.003

As can be seen in the above table, the mean score ($\bar{X}$=44.00, std.dev.= 9.09) obtained in the reading attitude scale by students subjected to augmented reality-based reading activities was higher than the mean score ($\bar{X}$=36.53, std.dev.= 8.19) obtained in the reading attitude scale by students subjected to the standard Turkish subject curriculum. The difference between the mean reading attitude scores of students subjected to augmented reality-based reading activities and mean reading attitude scores of students subjected to the standard Turkish subject curriculum is significant, t(52)= 3.17, p<.05, r= 0.40. The augmented reality-based reading activities explain 40% of the students' reading attitude. According to Cohen (1988), the calculated r value is regarded as a medium effect.

Comparison of class participation posttest scores of students in experimental and control groups

To determine whether there was a significant difference between class participation posttest scores of students in the experimental group, who were subjected to augmented reality-based reading activities, and students in the control group, who were subjected to the standard Turkish subject curriculum, analysis was made with the independent samples t-test. The independent samples t-test analyses related to class participation levels of students in the experimental and control groups following the implementation are shown in Table 12.

Table 12. Independent Samples t-Test Results Related to Class Participation Levels of Students in Experimental Group Subjected to Augmented Reality-Based Reading Activities and Students in Control Group Subjected to Standard Turkish Subject Curriculum

Class Participation Posttest Scores	Group	N	$\bar{X}$	Std.Dev	Sd	t	p
	Exp.	26	93.61	8.00			
	Control	28	74.28	11.19	52	7.24	.000

As can be seen in the above table, the mean score ($\bar{X}$=93.61, std.dev.= 8.00) obtained in the class participation scale by students subjected to augmented reality-based reading activities was higher than the mean score ($\bar{X}$=74.28, std.dev.= 11.19) obtained in the class participation scale by students subjected to the standard Turkish subject curriculum. The difference between the mean class participation scores of students subjected to augmented reality-based reading activities and mean class participation scores of students subjected to the standard Turkish subject curriculum is significant, t(52)= 7.24, p<.05, r= 0.70. The augmented reality-based reading activities explain 70% of the students' class participation. According to Cohen (1988), the calculated r value is regarded as a large effect.

Findings Obtained in Qualitative Dimension of Study

In this section, answers are sought to the question "What are the views of students in the experimental group related to augmented reality-based reading activities?" which is expressed as a research question in the qualitative dimension of the study. Data obtained in the qualitative dimension are given in the form of findings obtained from the interviews.

Qualitative findings obtained from interviews

Following the quasi-experimental implementation process, semi-structured interviews were conducted with the 26 students in the experimental group of the research. Following the content analysis that was made, the research findings were grouped under 3 main themes. These themes are *"Using AR in the teaching-learning process"*, *"Effect on students of using AR in the teaching-learning process"* and *"Suggestions"*.

Using AR in the Teaching-Learning Process

The first of the themes that emerged in line with the views of students in the experimental group was "Using AR in the teaching-learning process". Table 13 presents a summary of students' views related to augmented reality-based reading activities in the theme of "Using AR in the teaching-learning process".

Table 13. Views of Students Related to Augmented Reality-Based Reading Activities in Theme of Using AR in the Teaching-Learning Process

Theme	Category	Sub-Category	Code
USING AR IN THE TEACHING-LEARNING PROCESS	Advantages	In Technical Terms	Easy to use, real-like, three-dimensional
		Regarding the Student	Enjoyable, attractive, exciting, participative
	Disadvantages	In Technical Terms	Tablet gets stuck, application does not open
		Regarding the Student	Fear of dropping tablet, fear of misuse, unable to share with friends, difficult to hold

Examination of Table 13 reveals that the theme of using AR in the teaching-learning process is divided into two categories, namely, "advantages" and "disadvantages". Furthermore, each category is itself divided into sub-categories as "in technical terms" and "regarding the student". With regard to the technical advantages offered by AR, these were expressed as the fact that it is easy to use, real-like and three-dimensional, while in terms of the student the advantages were stated to be that it is enjoyable, attractive, exciting and participative. Examples of students' views on this subject are as follows:

"I really enjoyed myself in the lessons. It was very enjoyable. I understood that it was easier and more entertaining than the procedure we normally follow." (S9)

"It's as if the three-dimensional pictures were real, for example, the apples, I felt like I would eat them soon." (S22)

"The activities were very nice. When we held the tablet to the book, three-dimensional things appeared. I felt like I could really see them. For example, when I held the picture of Pamukkale, I really felt as if I were there." (S26)

When the disadvantages of AR are examined from the technical aspect, these were expressed as the tablet getting stuck and the application not opening, while from the student's point of view, the disadvantages were stated as fear of dropping the tablet, fear of misusing the tablet, inability to share the tablet with friends and difficulty in holding the tablet.

One of the students expressed the situation related to technical problems like this: *"The fact that the tablets sometimes got stuck was a situation I did not like. For example, we were watching a video. While everyone was watching, ours got stuck."* (S4) Another student stated, *"Sometimes the application did not open on the tablet, and I had problems there."* (S20)

The views of one of the students regarding situations presented in the disadvantages category in terms of the student are as follows: *"While I was using the tablet, I was very careful not to drop the tablet, as it belonged to someone else."* (S3).

Effect on students of using AR in the teaching-learning process

Another of the themes that emerged in relation to the augmented reality-based reading activities in the interviews held with students in the experimental group was that of "Effect on students of using AR in the teaching-learning process". Table 14 includes the categories, sub-categories and codes related to this theme.

Table 14. Views of Students Related to Augmented Reality-Based Reading Activities in Theme of Effect on Students of Using AR in the Teaching-Learning Process

Theme	Category	Sub-Category	Code
EFFECT ON STUDENTS OF USING AR IN THE TEACHING-LEARNING PROCESS	In terms of Reading Skills	Fluent Reading	Error-free reading, reading in a strong and lively voice, rapid reading and comprehension
		Vocabulary	Improvement of vocabulary
		Comprehension	Development of reading comprehension skills
		Reading Attitude	Love of reading
	In Cognitive Terms	Thinking Skills	Enabling thinking, mental development, development of imagination
		Academic Development	Increasing success, retention of learning, rapid learning
		Communication Skills	Ability to express oneself
	In Terms of Subject Area Knowledge	Acquisition of New Knowledge	The life of Atatürk, Healthy nutrition, Characteristics of animals, Invention of the light bulb, Beauties of our country

Examination of Table 14 reveals that the theme of effect on students of using AR in the teaching-learning process is divided into three categories, namely, "in terms of reading skills", "in cognitive terms", and "in terms of subject area knowledge". Furthermore, each category is itself divided into sub-categories.

The category of "in terms of reading skills" is presented as the sub-categories of fluent reading, vocabulary, comprehension and reading attitude. Below are examples of students' views regarding this situation:

"I learned new words thanks to the application" (S11), *"It enabled me to understand more easily while reading. It allowed me to develop my story reading further"* (S12), *"I learned to love reading more. For example, following this application I started to read more books. I loved reading more."* (S14)

When "in cognitive terms", which is another category, is examined, it is seen that the sub-categories of thinking skills, academic development and communication skills were formed.

Regarding the thinking skills sub-category, one of the students said, *"I think that it improved our imaginations, because in the application, we saw very different things than pictures in a text. This took me to different places."* (S25)

In the academic development sub-category, the views of one student were as follows:

"For example, when I didn't understand what I read, I had to read it again. But with the visuals on the tablet, I understood more quickly. For example, I had never seen the museum at Atatürk's house. But I saw it, and it became more permanent for me." (S25)

In the communication skills sub-category, one student stated his opinions about being able to express himself as *"When there were characters I loved in the activities, I wanted to join in the lesson more, answer more questions and explain myself"* (S4), while another student stated *"I used to find it a bit difficult to speak and express myself. It was beneficial in those respects."* (S10)

When the final category in this theme, which is "in terms of subject area knowledge", is examined, it is seen that the sub-category of acquisition of new knowledge was formed. In this sub-category, the students generally based their opinions on the knowledge they acquired about the texts they studied during the implementation. Some of the students' views regarding this situation are as follows:

"For example, I did not know that when inventing the light bulb, Edison tried to do this with cotton from his button. I did not know that he experimented with coconuts, or that he experimented with his guest's beard. I learned all of these" (S8), *"With the application on the tablet, I felt like I was going to places I had never visited in Turkey. I learned about these"* (S18), *"For example, by means of the tablets, we saw three-dimensional animals. I became more closely acquainted with the animals, I examined them and learned about their features"* (S19), *"There were very strange things. For example, when I held the tablet to the paper, weird things happened. The way the visuals and pictures appeared was very interesting. When I heard Atatürk's actual voice, I was very impressed. For example, when I hear or see something related to the subjects we learned, the applications on the tablet spring immediately to mind. Whenever I see a light bulb, I think of Edison; whenever I look at a picture of Atatürk, I remember Atatürk's voice."* (S21)

Suggestions

The final theme to emerge as a result of the interviews held with the students was expressed as "Suggestions". Table 15 presents a summary of students' views related to this theme.

Table 15. Views of Students Related to Augmented Reality-Based Reading Activities in Theme of Suggestions

Theme	Category	Sub-Category	Code
SUGGESTIONS	Using AR in Education	User Group	It should be used in every grade
		Application Period	The application period should be increased
		Lesson Process	It should be used continuously in Turkish lessons
			It should also be used in other lessons
		Number of Tablets	The number of tablets should be greater

When Table 15 is examined, it can be seen that the suggestions theme is presented as a single category, namely, "Using AR in education". However, under this category, there are four sub-categories, named "user group", "application period", "lesson process", and "number of tablets". With regard to the user group, which is one of the sub-categories, one of the students stated, *"It was a very nice activity. I hope these activities are included in every grade and that they also will see them and acquire knowledge. By means of this lesson, I have learnt a lot of things."* (S11) In the lesson process sub-category, students offered opinions stating the necessity both for the Turkish lessons to be continuously conducted in this way and for this application to be used in other lessons as well. In this regard, students expressed opinions such as *"They were meaningful activities. I think all lessons should be conducted in this way"* (S5), *"Sometimes, I say that we should conduct our lessons with our teacher in this way."* (S22) Finally, one of the students expressed his view that the number of tablets used in the application should be greater, as follows: *"For example, if everyone had a tablet each, or else one tablet could be used by two people. That is, the number of tablets could be higher."* (S17)

CONCLUSION AND DISCUSSION

1. It was seen that the augmented reality-based reading activities had a positive effect on the students' reading comprehension skills. The fact that during the implementation, students in the experimental group, in contrast with the traditional Turkish lessons conducted in the control group, used augmented reality, which is a technology-based application, and that the students interacted with this technology in the activities, can be stated as a reason for this positive effect, since AR technology appeals to many more senses that make learning meaningful (Núñez et al., 2008) and provides benefits for students who have difficulty in learning two-dimensional texts (Billinghurst & Duenser, 2012). When the conducted studies are examined, the findings generally show parallelism with those of the current study (Huisinga, 2017; Retter et al., 2013; Romano, 2015). In a study made by Vate-U-Lan (2012), the aim was to teach English by means of a three-dimensional AR book to children attending a school in Bangkok. The results of the study reveal that the students' comprehension, learning and class participation increased.

2. It was seen that the augmented reality-based reading activities were effective in increasing the students' motivation to read. It is thought that because AR technology is three-dimensional and works in integration with a real environment, and in the prepared AR activities, cartoon characters, colourful and real pictures and videos at a suitable level for attracting students' attention are utilised, it assists in the development of reading motivation. When the studies in the literature are examined, there are numerous studies in different areas showing similarity with the results of the present study and stating that AR supports motivation (Delello, 2014; Küçük, Yılmaz & Göktaş, 2014; Thornton, 2014). An AR-supported pop-up English story book was designed for five 7th grade students attending a school in Malaysia. Each student was given the opportunity to practise with this book. The interviews that were made at the end of the implementation revealed that the students' motivation had increased (Mahadzir & Phung, 2013).

3. It was also seen that the augmented reality-based reading activities had a positive effect on the students' attitudes towards reading. *Vis-à-vis* the results that appeared in the students' reading motivation, this finding is expected, as there is a positive relationship between motivation and attitude. Furthermore, the fact that the students benefited from their favourite characters in the application, that songs and visuals were used in the activities, and that during the development of the application, views of specialists in the fields of reading and AR were obtained, may have enabled the results to be effective. When studies conducted in the related literature are examined, there are studies in different areas which have obtained similar results to those of the current study and which state that AR supports attitude (Agorou, Kallinikou, Kyriacou, Miltiadous & Nicolaidou, 2018; Cheng, 2017; Kerawalla, Luckin, Seljeflot & Woolard, 2006; Sumadio & Rambli, 2010; Wojciechowski & Cellary, 2013). Cheng (2017) examined the effect of an AR book-reading activity on motivation and attitudes of 153 students. The findings generally reveal that while reading the AR books, the students displayed stronger motivation and a more positive attitude towards the activities.

4. The augmented reality-based reading activities were also effective in increasing students' engagement in class. The fact that the results were positive can be shown as the fact that, as stated above, affective factors such as attitude and motivation that affect engagement in class increased due to the implementation. That is, a student who loves the subject and takes an interest in it will have a positive attitude towards that subject. Since he has a positive attitude, he will be motivated towards the subject, and a motivated student will also participate more in the lessons. Therefore, it can be expected that the results of the research will emerge in this way. When the studies in the literature are examined, there are studies which show similarity with the results of the present study and which reveal the effect of AR on engagement in class in many areas from science education, art education and mathematics to language use (Delello, 2014; Di Serio et al., 2013; Han, Jo, Hyun & So, 2015).

5. The students' views related to the augmented reality-based reading activities are generally positive. The first thing that students stated in relation to the AR application was that the application is

easy to use. This finding shows that in keeping with the age we live in, the AR application can be easily used during the teaching-learning process. When related studies are examined, it is seen that a number of studies have obtained similar results (Sin & Badioze-Zaman, 2010; Tian, Endo, Urata, Mouri & Yasuda, 2014). Furthermore, the fact that the application is realistic, enjoyable and participative are advantages of AR that were mentioned. Indeed, the fact that AR creates a feeling of reality and is three-dimensional is one of the main factors that made the application enjoyable for the students, since the fact that traditional lessons were continually conducted with two-dimensional material and that some activities did not go beyond the book may have caused the students to become bored. Moreover, the fact that AR appeals to a number of senses may have made the subject enjoyable for the students. Though few in number, some students held views expressing what they regarded as negative situations under the heading of disadvantages of AR, to the effect that besides technical situations such as the fact the tablet got stuck or did not open in some applications, they were afraid of dropping or misusing the tablet or had difficulty in holding it. It is thought that the reasons why technical problems were observed may be because some tablet software programs found it difficult to support the application, or else it may be due to a situation arising from daylight, since when there is insufficient daylight or it comes from an opposite angle, the tablet cannot focus on the image in the application and cannot perceive the image. Situations such as fear of dropping or misusing the tablet or difficulty in holding it, which are problems arising from the student, may be due to the fact that students did not have enough interaction with tablets in their daily lives or that the tablets did not belong to them. In terms of the technical aspect of AR, similar findings have been achieved in studies in the literature (Erbaş, 2016; Ibáñez, Di Serio, Villarán, & Kloos, 2014). In the second theme constituting the findings obtained from the qualitative research results, students mostly stated that using AR in the teaching-learning process improved their vocabulary, comprehension and attitude towards reading. The views that were obtained generally support the quantitative dimension of the research. The fact that the activities included within the AR application were enjoyed by the students and attracted their attention may have helped the students to develop their reading skills. Moreover, the visuals and videos that supported the content of the texts may have enabled their intertextual thinking. Consequently, this may also have facilitated their understanding of the text or the increase of their vocabulary. There are studies in the literature that support this finding (Huisinga, 2017; Slijepcevic, 2011; Retter et al., 2013). In research which was carried out with the aim of improving students' reading, writing, speaking and listening skills by means of AR, it was concluded that students' vocabulary also increased (Özarslan, 2013, cited from Slijepcevic). One of the situations expressed was also the fact that according to the students, AR developed their thinking, academic and communication skills. In this context, students stated that they were intellectually active during the application, that their imagination developed, that their success in the subject increased and that their self-expression skills improved. The fact that AR appeals to more than one sense and that different activities and visuals are used in relation to the subjects taught, assisted in the development of the students' imagination just as it enabled their active intellectual engagement. Moreover, the students' interpretation of the visuals, videos and texts during the implementation also enabled them to express themselves. Naturally, this process increased their success in the subject. A number of studies are found in the literature that have determined that AR improves academic achievement (Dünser, 2008; Eroğlu, 2018; Şahin, 2017). One of the views expressed by the students was that AR helped them to acquire new knowledge. During the implementation, six different texts were used within the AR. The students stated the benefit provided by AR in obtaining information from the texts that were used. The reason for this is that the videos or visuals used in the texts that were taught went beyond the written text and were informative, which attracted the attention of the students. In the literature, applications related to AR were carried out on a certain subject in numerous studies. The results that emerge generally state that AR is beneficial for teaching that subject (Eroğlu, 2018; İbili, 2013; Sırakaya, 2015; Şahin, 2017). The students stated the necessity for longer applications when using AR, for AR to be used in other subjects besides Turkish, and for it to be carried out with an increased number of tablets. The reason why these views were presented may be because the implementation was limited to a total of 30 hours over a period of six weeks with five hours per week, that the number of tablets was limited to one tablet per three people, and that the implementation was carried out only in Turkish lessons during the research. When the situation is examined in a positive sense, however, it is

concluded that the students were satisfied with the AR application, and that for this reason, they wanted it to be used in other lessons and for longer periods.

In line with the findings obtained as a result of the study, it is seen that in studies in which augmented reality is used in the literature, it is generally used in numerical subjects such as science, geometry and mathematics. In order to expand the area of use of AR in education, its use can be extended to subjects such as Turkish and social sciences. With regard to the subject of Turkish, activities can be developed in areas other than reading, such as writing, listening and speaking. Seminars or in-service training can be provided for teachers regarding the use of this technology, which is new to our country and whose use in education is not yet widespread, in their classes. In studies to be conducted in the future, activities can be conducted with students who have learning difficulties, and applications can be carried out with students who have different competencies.

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