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The impact of the ein supported math education on students' achievement and opinions in 5th grade geometry teaching

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The aim of this study is to observe the effect of Education and Informatics Net (EIN) supported math teaching on students' success in geometry teaching 5th grade level and to observe students' comments on EIN. This study was conducted in the 2nd term of 2018-2019 school year. Both qualitative and quantitative research methods were implemented. Pre-test and post-test controlled grouped quasi-experimental design was used in the research's quantitative part. While 5th grade geometry subjects were taught via course books and concrete materials to one group, the other group was exposed to EIN supported math teaching methods. The research sample is limited, comprising Giresun city, 34 secondary school students, of whom 17 each were for the experimental and control group. An achievement test consists of 25 questions was developed by the researcher and its validity and reliability were checked by experts in the field. The achievement test was implemented through both groups as pre-test, post-test and permanency test after 8 weeks. The collected data was administered through SPSS 24.0 package program. Paired t-test and unpaired t-test were used to analyze the collected data. Students were asked to answer the beforehand prepared feedback form that consists of questions about the use of EIN in the qualitative part of the research. When the quantitative data results are analyzed, both of the groups had succeeded in learning 5th grade geometry subjects. However, it is seen that experimental group students are more successful than the ones in control group. Permanent learning happened in both of the groups. In addition, it is clear that students have positive attitudes towards EIN according to qualitative data results.

Key words: Educational Informatics Network (EBA), 5th grade geometry teaching, geometry.

INTRODUCTION

Recently, in addition to the rapid developments in science and technology, educational programs have been constantly renewed and have undergone new changes in order to carry out contemporary teaching models. These innovations in educational programs aim to make the students more active in teaching environments. While

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technology is taking place in all areas of our lives, it has become inevitablein the field of education as well. Considering that learning knowledge by hearing does not maket it permanent knowledge for students, Mathematics education is supported by technology, visualizing knowledge during learning process and having students try to access it by themselves makes a more permanent learning for them.

Likeall other parts of the World, in our country -beside the new instructional approaches, the power of technology is utilized in order to solve the problems faced in education “With the rapid development and change in technology and science, in many areas such as economy, culture, politics and education, the expectations vary according to the society we live in. In the light of these developments, especially in the world of education, severe differences have been experienced, important information about how individuals learn has been reached, and various new approaches have been developed to respond to the needs of the society” (Doruk, 2010). In this context, the purpose of education is "to train people who are constantly learning, who can apply the knowledge they have learned, who can think critically and have problem solving skills, who can produce new ideas, find solutions, and who are not unfamiliar with innovations” (Olkun and Toluk, 2003). In terms of mathematics education, it is expected from mathematics educators to raise individuals who are able to produce effective solutions in real problematic situations, associate the mathematical knowledge they've learnt with their daily life,who are aware that the mathematics and the world they live in are a whole, and consequently, who love mathematics andare not afraid of it (Çiltaş and Yılmaz, 2013). “Mathematics emerged parallel with the needs of society -with counting and measuring, and today it, especially with its frequent use in technology, has gained an important place among other sciences” (Çiltaş, 2011). According to Altun (2008), the aim of mathematics teaching is to “provide a person with the mathematical knowledge and skills required by daily life, teach him/her how to solve problems and make him/her acquire a way of thinking that handles events in a problem-solving approach”.

Learner-oriented educational activities have an important place in modern learning approaches. In Turkey, Educational Informatics Network (EBA) developed by the Ministry of Education, provides significant benefits to educators and students in this regard (Bolat, 2016). Educational Informatics Network (EIN) is defined as “an online social education platform offered to individuals -free of charge, by the General Directorate of Innovation and Educational Technologies (EIN, 2016). Today, EIN, which includes many services for education, is highly used by primary and secondary school students. EINstarted to broadcast in 2012, became enriched by being renewed for changing needs and became the world's largest content service. It seems that “the EIN system was used by 10 million primary and secondary school students in the academic year of 2015-2016. The EIN is a system that includes educational contents in addition to educational tools that teachers and students can use.Including resources in video formats, in addition to resources with audio, text and picture formats, EIN is a system that supplies users with facilities such asuploading files, cloud storage, organizing competitions, lectures suitable for various levels, making announcements and doing other kinds of sharings by users. These possibilities are only some of the features that enrich the EIN system (Aktay and Keskin, 2016).

The previous research shows that EIN has positiev effect on learning math, students who were taught using had higher level of learnings (Artun et al., 2018) also the students were more succesful in various subjects (Hastürk and Ballıell, 2018), and it faciliated learning proving to be a more efficious way of teaching. Lastly, the research provided evidence that it increased spatial ability in terms of math teaching (Özlü, 2014).

E-contents in the EIN should address to different learning styles. One of these is visual ability. Spatial ability is linked to many areas related to daily life. High level visual ability is also associated with formations and productivity in art, science and mathematics. Famous physicists (Albert Einstein, Newton) who succeed new inventions (Richard Stallman and Linus Torvalds) and scientists (Aziz Sancar, Feynman, Pascal) have also succeeded with their advanced spatial abilities, and stated that this ability was an important factor in their most impressive formations. Although there are contradictory situations in the studies regarding to what extent spatial ability can be improved and developed, many studies have shown that spatial ability can be developed through education when the appropriate environment and materials are given” (Olkun, 2003: 40). It is stated that the activities in the curriculum are not sufficient to improve spatial abilities as a result of the studies conducted in our country (Kayhan, 2005; Turğut, 2007; Kakmacı, 2009). For this reason, there is a need for new scientific products to improve spatial abilities. Turğut (2007) reached the conclusion that the level of spatial skills is not high in his study on students at the second level of primary education. For this reason, students need different learning approaches for their developmental situations, activities and acquisitions appropriate to the contents. It is believed that EIN supported math teachings would be more effective and efficous as it has been proven to support learning and increase spatial ability of students. Because it provides more oppurtunities for learning.

Problem

The main problem of this study is "In 5th grade Geometry Teaching, does the teaching by using the Educational

Table 1. Experimental design of the study.

Groups	Preliminary measurements	Applications	Final measurements
Experimental group	Mathematical achievement test (Pretest)	Activities for EIN	Mathematical achievement test (Post-test) Semi-structured interview form
Control group	Mathematical achievement test (Pretest)	Applications for the MoNE program	Mathematical achievement test (Post-test)

Table 2. Distribution of students in the experimental and control groups by gender.

Gender	Experimental Group (Learning according to EIN-supported approach)	Control group (Traditional learning)	Total
Female	8	7	15
Male	9	10	19
Total	17	17	34

Informatics Network (EIN) system and traditional methods have an effect on the academic success of students?"

The sub-problems

1. Is there a statistically significant difference between the pretest scores of the experimental and control groups?
2. Is there a statistically significant difference between the post-test scores of the experimental and control groups?
3. Is there a statistically significant difference between the pretest and post-test scores of the experimental group?
4. Is there a statistically significant difference between the pretest and post-test scores of the control group?
5. What are the opinions of the students of the experimental group, who do the EIN-supported practices for the geometrysubjects in the 5th grade, about the EIN activities, geometry teaching, and practices?

METHODOLOGY

In this study, quantitative and qualitative research methods were used together. Therefore, the research method is a mixed research method. Creswell (2008) defines the mixed research method as a procedure for collecting and analyzing qualitative and quantitative data in a mixed way at the stages of the relevant research process in order to fully understand a research problem. Creswell (2017) determined three basic mixed-method patterns in mixed research methods in accordance with the purpose. In this research, an explanatory sequential pattern from these designs was used. In explanatory sequential research studies, quantitative data are collected first, and qualitative data are collected and analyzed in order to examine the results obtained from quantitative data in depth (Mc Millan and Schumacher, 2010). In this study, first, quantitative data were collected in order to determine the learning levels of 5th-grade students about geometry subjects, and then the results obtained in the light of the collected qualitative data were examined in depth.

The research was conducted by choosing one of the two equal branches as the experimental group and the other as the control group. During the research process, applications were conducted before and after the research in both groups. The research design is shown in Table 1. After the application, interviews were made with the students in the experimental group using the interview form prepared. An interview is defined as communicating with people for specific purposes. The main purpose of the interview is to reveal the feelings, thoughts, and beliefs of the individual interviewed about the subject being studied (Çepni, 2010: 51). For this reason, interviews were conducted to learn the thoughts of the students about the EIN-supported Geometry Teaching after the application.

Participants

Necessary legal permissions for the research were obtained from the Giresun Provincial Directorate of National Education. The universe of this research consisted of 2nd-level primary education students in Giresun. The sample of the study consisted of 6-H and 6-E classes in the 15 Temmuz Imam HatipIntermediate School in the Central district of the province of Giresun in the second semester of the 2018-2019 academic year. In the sample, there were 34 students in total, 17 students in 5-E class that made up the experimental group, and 17 students in 5-F class that made up the control group. The distribution of the students by gender in the experimental and control groups is given in Table 2.

Data collection tools

The following data collection tools were used to collect data in this study.

(1) Mathematical achievement test
(2) Semi-structured interview form

Mathematical achievement test

In order to measure the success of the participating students concerning the geometry subjects, an achievement test included geometry subjects was created. Since themathmatical achievement test was going to be held in a class time duration (40 min), it wasdecided to be consisted of 25 test questions. Therefore, a test of 40 questions, consisted of questions applied in the Scholarship

Examinations by the Ministry of National Education (MoNE) in the previous years and in the 5th grade acquisition comprehension tests recently broadcasted on the official website of the MoNE, was created. In order to ensure the content validity of the mathematical achievement test, the opinions of 1 expert in the field of mathematics education and 4 mathematics teachers were taken. The pilot application of the achievement test was carried out with a total of 100 students who had been taught the geometry subjects in the previous year. The answers given by each student to the questions were recorded one by one, and the discrimination powers (d) of the questions were calculated. The distribution of the discrimination power of the items in the test is shown in Table 1.

The semi-structured interview form

In the research, after the application, a Semi-Structured Interview Form was prepared in order to find out the students" opinions about the EIN-supported Teaching Activities. Before preparing the interview form in the research, the documents used in the studies on EIN-supported education were examined. As a result of the examination, a draft interview form was prepared from the documents obtained using the observations of the researcher during the application, secondary school mathematics textbooks, and the mistakes made by the students during the application. This interview form was then discussed with three academicians who were experts in their fields and two math teachers. Before the semi-structured interview form was applied to the students in the experimental group, a pilot study was conducted with 3 students, who were not members of the experimental group, on the clarity and comprehensibility of the interview items and the adequacy of the 15-20 min time allocated for the interview. The final version of the interview form was created by eliminating the identified deficiencies in all the interviews and making the necessary arrangements. In the interview form, questions about the place of the EIN approach and other approaches in the current mathematics curriculum, the applicability of the in-class activities and the approaches offered by the program, and the students' opinions about the EIN-supported teaching were included.

Application process

The following procedures were applied respectively to both the experimental and control groups in the study.

1. Academic achievement tests and semi-structured interview form, which were the data collection tools of the research, were prepared.
2. For the application, a permit application was made to the GiresunDirectorate of National Education through Giresun University Institute of Educational Sciences, and necessary permissions were obtained.
3. The experimental and control groups of the students studying in the 5th-grade branches in the school where the application would be held were determined by the neutral assignment method.
4. Before starting the application, teaching materials were prepared in accordance with the objectives and target behaviors of the geometry course.
5. Before starting the application, monthly course hours were determined in the experimental and control groups, and the total course hours recommended by the Ministry of Education were followed.
6. The mathematical achievement test was applied as a pretest to the experimental and control groups.
7. Teaching techniques suitable for the EIN-supported teachingtechniques were used in the experimental groups. In the control groups, traditional teaching methods, i.e. lecturing and question-answer techniques were used.
8. All subjects were taught to the experimental and control groups by the researcher.
9. After the application, the academic achievement test was applied to both groups as a post-test.
10. All quantitative data obtained were analyzed.
11. After the application, interviews were made with randomly selected students in the experimental group. The qualitative data obtained were analyzed.

Data analysis

The analysis of the results obtained in the research was made as follows:

Analysis of quantitative data

SPSS package program was used to analyze the data. All the data obtained were entered into the program, and necessary measurements were made. To determine whether there was a significant difference in the comparison of pre-test, post-test, and retention test results of the experimental group and the control group, *t-Test for Independent Groups* was used. To determine whether there was a significant difference in the comparison of the pre-test and post-test results of the experimental group and the control group and the post-test retention test results, *t-Test for Dependent Groups* was used.

Analysis of quantitative data

The content analysis method was used to analyze the students' views about teaching according to the EIN-supported teaching. Büyüköztürk et al. (2008) describe content analysis as a systematic, renewable technique in which some words of a text are summarized with smaller content categories through coding based on certain rules. In the content analysis, the collected data are firstly listed, then the themes are determined, and finally, the themes are organized (Yıldırım and Şimşek, 2011).

RESULTS

This study used a mixed method research design that included quantitative and qualitative analysis that lead discussion as show in Figure 1.

Results regarding the first sub-problem

Since the number of observations in the experimental group was 17 in the normality test performed with the data related to the first sub-problem, the Shapiro-Wilk analysis was performed, and it was found that the p-value indicated by the significance level was 0.508. Since the number of observations in the control group was 17 in the normality test performed with the data related to the first sub-problem, the Shapiro-Wilk analysis was performed again, and it was observed that the p-value indicated by the significance level was 0.145. The results of the t-test for independent groups are shown in the Table 4. Effect sizes are shown in table 3.

In the t-test conducted to determine whether there was a significant difference between the pretest results of the

Figure 1. Mixed method research design.

Table 3. Distribution of items according to discrimination power for mathematical achievement test.

Discrimination power	Number of Items	Percentage	Evaluation
d > 0.40	6	24	Very good
0.30 > d > 0.39	8	32	Fairly good
0.20 > d > 0.29	11	44	Need to be corrected

Table 4. Test results regarding the pretest results of the groups.

Groups	N	$\bar{X}$	S	sd	t	p	Effect (d)
Experimental	17	9,59	2.526	32	0.410	0.684*	0.21
Control	17	9.88	1.536				

*p<0.05 significant.

Table 5. Test results regarding the post-test scores of the groups.

Groups	N	$\bar{X}$	S	sd	t	p	Effect (d)
Experimental	17	12.76	4.085	32	1.355	0.022*	0.55
Control	17	11.18	2.58				

*p<0.05 significant.

experimental group students and the control group students, no significant difference was observed between the average test score of the students in the experimental group ($\bar{X}_{experimental}$ = 9.59) and the average test score of the students in the control group ($\bar{X}_{control}$ = 9.88), [$t_{(35)}$ = 0.410, p>0.05]. In this case, it can be said that the students in the experimental and control groups before the application were at the same level.

Results regarding the second sub-problem

The second sub-problem of the study asked "Is there a statistically significant difference between the pre-test and post-test scores of the experimental group?" Since the number of observations was 17 in the normality test performed with the data related to the second sub-problem, the Shapiro-Wilk analysis was performed, and it was found that the p-value indicated by the significance level was 0.08. According to Can (2017: 89), the fact that the p value is greater than 0.05 (accepting the absence hypothesis as "there is no difference with the normal distribution") means that normality is achieved. The result of the normality test shows that the t-test can be performed for related samples, which is a parametric test. The results of the t-test for independent groups are shown in Table 5.

In the t-test conducted to determine whether there was a significant difference between the post-test results of the experimental group students and the control group students, a significant difference was observed between the average test score of the students in the experimental group ($\bar{X}_{experimental}$ = 12.76) and the average test score of the students in the control group ($\bar{X}_{control}$ = 11.18), [$t_{(35)}$ = 1.355, p<0.05]. When the test averages of the groups are examined, it is seen that the students in the experimental group to whom the EIN method was applied were more successful in 5th-grade geometric subjects than the students in the control group who were taught with the traditional method. The effect size of this

Table 6. Test results regarding the experimental group's pretest and post-test scores.

Measurement	N	$\bar{X}$	S	sd	t	p	Effect (d)
Pretest	17	9.59	2.526	16	-7.374	0.000*	4.15
Post-test	17	12.76	4.085				

*p<0.05 significant.

Table 7. T-Test results for dependent groups regarding the control group's pretest and post-Test Scores.

Measurement	N	$\bar{X}$	S	sd	t	p	Effect (d)
Pretest	17	9.88	1.536	16	-3.928	0.000*	1.71
Post-test	17	11.18	5.253				

*p<0.05 significant.

success ($d = t.\sqrt{\frac{N1+N2}{N1.N2}}$) was calculated as 0.55. This shows that the difference in achievement between the students in the experimental group and the students in the control group is medium.This finding is in line with previous findings indicating the EIN supported teaching increases the students`learnings (Balliel, 2018)

Results regarding the third sub-problem

Since the number of observations in the normality test conducted with the third sub-problem was 17, the Shapiro-Wilk analysis was performed, and it was found that the p-value indicated by the significance level was 0.08. The results of the t-test for dependent groups are shown in the Table 6. As a result of the t-test for dependent groups conducted to determine whether there was a significant difference between the pretest and post-test scores applied to the students in the experimental group, a significant difference was observed between the average pretest score ($\bar{X}$= 9.59) and the average post-test score after the application ($\bar{X}$= 12.76) [$t_{(20)}$ = -7.374, p<0.05]. The effect size calculated according to the test result (d = 4.15) shows that this difference is at a high level. In general, in terms of the value of d, a value above one is interpreted as very large, while 0.8 is referred to as large, 0.5 medium, and 0.2 small (little) effects (Taşpınar, 2017: 57). In this case, it can be interpreted that teaching with the realistic mathematics education method in the aforementioned group had a significant effect on the test success of the students. This finding is in line with previous findings indicating the EIN supported teaching increases the students`learnings (Hastürk and Balliel, 2018).

Results regarding the fourth sub-problem

Since the number of observations in the normality test conducted for the third sub-problem was 17, the Shapiro-Wilk analysis was performed, and it was found that the p-value indicated by the significance level was 0.103. The results of the t-test for dependent groups are shown in the Table 7. As a result of the t-test for dependent groups conducted to determine whether there was a significant difference between the pretest and post-test scores applied to the students in the control group, a significant difference was observed between the average pretest score ($\bar{X}$= 9.88) and the average post-test score after the application ($\bar{X}$= 111.18) [$t_{(15)}$ = -3.928, p<0.05]. The effect size calculated according to the test result (d = 1.71) shows that this difference is at a high level. In this case, it can be interpreted that teaching with traditional methods applied in the aforementioned group had a significant effect on students' test success.This finding is in line with previous findings indicating the EIN supported teaching increases the students`learnings (Hastürk and Balliel, 2018).

Results regarding the fifth sub-problem

The fifth sub-problem of the research is consist of the experimental group students" opinions, in the 5th grade classrroms in which the EIN-supported applications on geometry subjects done, on the use of EIN, its contents, its dissemination, the adequacy of the contents and the EIN supported lectures.After the activities carried out with the students in the experimental group with the method supported by EIN, the students' opinions were taken by applying the semi-structured interview form in Annex developed by the researcher. Students' opinions taken with open-ended questions were examined and evaluated separately. These questions and the answers given by the students to these questions are shown below in tables.

Question 1: What are your opinions on the ease of use of the EIN platform?

Table 8. The responses given by the participants to Question 1.

Participants	Views
P_1	Comfortable, easy
P_2	Comfortable, easy
P_3	Difficult
P_4	Comfortable, easy
P_5	Comfortable, easy
P_6	Easy
P_7	While signing in I"m asked to submit information that I don"t know
P_8	Easy
P_9	Comfortable, easy
P_{10}	Easy
P_{11}	I can sign in on every device connected to the internet
P_{12}	At First it was difficult, but it is easier when get familiar.

Table 9. The responses given by the participants to Question 2.

Pariticipant	Views
P_1	Made it easier, the exercises made me understand the subject
P_2	It made me to revise the subject easily
P_3	Videos made me understand the subject better
P_4	It didn"t make it easier; videos are inadequate
P_5	I grabbed the minor details that I didn"t understand
P_6	Subjects are more enjoyable and more entertaining
P_7	I play games on EIN when I give a break. It becomes more entertaining and more tutorial
P_8	It makes the subject more difficult; the activities are inadequate
P_9	It makes the subject easier, there are tests and lectures
P_{10}	It doesn"t make it easier because lectures are too bad
P_{11}	It doesn"t make it easier because I understand the subjects
P_{12}	It makes the subject easier because it lectures like a teacher.

The responses given by the participants to Question 1 are presented in Table 8. When Table 8 is examined, the views of most students using the EIN about the EIN are that it is comfortable and easy to use. On the other hand, 25% of the students stated that they had difficulty with signing in the EIN, and some were asked to submit their identity card Vol number. Some students complained that the videos freeze while watching.

Some of the participants' views about the EIN are as follow:

P3: I think the EIN is the best application made for students. Students have fun and they learn. What else could anyone ask for?

Question 2: What do you think about using EBA contents while learning a subject makes it easier for you to understand the subject or not? Why?

The responses given by the participants to Question 2 are presented in Table 9.

When Table 10 is examined, it can be seen that the use of the EIN in forming the acquisitions facilitates most of the students learning. It was stated that the lecture videos, tests and educational games in the EIN facilitate comprehensing the subjecs better and it is a good tool to revise the subject. Some of the participants' views on this question are as follows:

P4: Since I understand my subjects, I sign in the EIN a little. That's why it does not make it very easy. I usually use it when the teachers give homework.

Question 3: What are your views on disseminating the classes to be given by using the EIN contents?

(a) It should be disseminated because...

(b) It shouldn"t be disseminated because...

The responses given by the participants to Question 3 are presented in Table 10.

When Table 11 is examined, it is seen that some of the students stated that the courses made using EBA contents should be generalized and some stated that it

Table 10. The responses given by the participants to Question 3.

Participants	Views
P_1	Useful
P_2	Enjoyable, entertaining
P_3	Make the subject revisable
P_4	Easy, understandable
P_5	Fast accessibility
P_6	Visually interesting
P_7	Different ways of lecturing
P_8	Using the time more efficiently
P_9	Memorisable
P_{10}	Videos of lectures are inadequate
P_{11}	Make it difficult to learn during the classes.
P_{12}	Lectures are too bad

Table 11. Tthe responses to the option a of the question 4 in the interview form.

Participants	Views
P_1	Yes, sufficient
P_2	Yes, sufficient
P_3	Yes, sufficient
P_4	Yes, sufficient
P_5	Yes, sufficient
P_6	Yes, sufficient
P_7	Yes, sufficient
P_8	Yes, sufficient
P_9	Yes, sufficient
P_{10}	No, not sufficient
P_{11}	No, not sufficient
P_{12}	No, not sufficient

was unnecessary.
Some of the participants' views on this question are as follows:
P6: It should not be disseminated because some children may enter unsuitable websites lying that they are studying at the EIN.
P5: It should be disseminated. There should be more lecture videos and the topics should be lectured in more details as our teachers lecture. So we can solve test questions better.

Question 4: Do you think the knowledge on the EIN related to this subject is sufficient?
The responses given by the participants to Question 4 are presented in Tables 11 and 12.
When the tables are examined, it is seen that the students do not have a weighted opinion about the content of lecturing on the EIN supported geometry teaching. It can be declared that the exercises part in the EIN is found insufficient by most of the students.
Some of the students' responses to this question are as follows:
P6: Lecture is enough because there are 8-10 videos on a topic. The number of exercises need to be increased and the examples should not be that simple.

Question 5: If this subject was lectured without the EIN contents, what would be the difference between the two types of learning approaches? Explain.
The responses given by the participants to Question 5 are presented in Table 13. When Table 13 is examined, it is seen that subject teaching by the EIN supported approach is beneficial for students. Some of the students stated that they learnthe subject faster thanks to the EIN; if the EIN was not in use, it would take longer to learn the subject and they would not be able to complete the subject deficiencies. However, some of them stated that lectures by their own teachers are better and the EIN is

Table 12. Tthe responses to the option b of the question 4 in the interview form.

Participants	Views
P_1	Yes, sufficient
P_2	No, not sufficient
P_3	No, not sufficient
P_4	No, not sufficient
P_5	Yes, sufficient
P_6	No, not sufficient
P_7	Yes, sufficient
P_8	No, not sufficient
P_9	Yes, sufficient
P_{10}	No, not sufficient
P_{11}	No, not sufficient
P_{12}	No, not sufficient

Table 13. The responses to the question 5 in the interview form.

Participants	Views
P_1	I would not be able to learn the subject quickly
P_2	It would be difficult to remember it
P_3	It would take long to learn it
P_4	With the wideos the subject is permanent on my mind
P_5	I would not remember the subject quickly while revising it
P_6	I would not be able to complete the subject deficiency
P_7	There wouldn't be any difference
P_8	It would take long to learn it
P_9	I would not be able to learn the subject quickly
P_{10}	I would not be able to complete the subject deficiency
P_{11}	I would not be able to complete the subject deficiency
P_{12}	There would not be any difference

not needed. Some of the students' responses to this question are as follows:

K3: Yes, there would be a difference. We would spend more time to learn the subjects, and we would have less time remain for other lessons.

As a result of the interviews, when the answers given by the students to the interview questions are examined in general, it can be said that all students find the EBA-supported method useful and they think that using this method in all lessons can improve themselves positively. Students generally stated that they had the opportunity to learn abstract concepts much better by having fun and exploring with the EBA-supported method. They also stated that this and similar methods should be used in other subjects and other lessons and that these methods should be generalized in a way that everyone can benefit from.

In this study, the effect of EBA-supported teaching on students' academic achievement in teaching 5th grade Geometry subjects was examined.

DISCUSSION

In the reasearch, correspondingly to what is aimed, the mathematical achievement test was applied to both groups as a pre-test in order to determine the prior knowledge of the experimental and control groups about the geometric objects. According to the analysis results, it was concluded that there was no statistically significant difference between the prior knowledge of geometry subjects of both groups. This result shows that the experimental and control groups in which the research was conducted are homogeneous, in other words they are identical.

In the research, geometry subjects were taught to both groups, and the mathematical achievement test was applied to both groups as a post-test after the teaching activity. According to the results of the analysis, it was determined that the average test scores of the experimental group in which the teaching was carried out by using the EBA-supported method, increased more

than the test score average of the control group where the teaching was carried out using the traditional method. Moreover, in the results of the analysis, it was determined that there was a statistically significant difference between the post-test avarage scores of both groups. Since the difference between the scores of the experimental group students is greater than the difference between the scores of the control group students, It can be concluded that the EBA supported method is more effective in teaching geometry subjects.

In the research, the mathematical achievement test was applied as a retention test to both groups 8 weeks after the application. According to the results of the analysis, no statistically significant difference was found between the post-test scores and the retention test scores of the experimental group students. This situation shows that the knowledge of the students in the experimental group about geometry, which they have learned by discoveringthemselves, is permanent. A statistically significant difference was found between the post-test scores of the control group students and their retention test scores. In this case, it can be said that the control group students' knowledge about geometry, which they learned with traditional teaching methods, is not permanent.

The results are in line with previous research. Considering the literature, in the study of Hastürk and Ballıel (2018), it was concluded that the students were more successful in the experimental group where the subjects were handled using the contents on the EIN. Artun et al. (2018) determined that the teaching using the EIN contents has a positive effect on students' learning. In their study, Eryılmaz and Salman (2014) found that using e-content during teaching subjects facilitates and quickens learning subjects. Turğut (2010) and Özlü (2014) concluded that teaching supported by technology improves spatial abilities of students.

As a result of the evaluation of the students data in the interview form, the students stated that it is not difficult to use EBA and that they do not have trouble when using the EIN. However, they said that they had problems while signing into the EIN system. The students expressed their views that during the teaching phase of the subject, the exercises in the EIN contents were useful to them that they used them to revise the topics, and the visuality of the contents was adequate. Moreover, it was determined that the students demanded the EIN-supported contents to be applied more in the classes. Some of the students thought that the exercises section in the EIN was insufficient, while others stated that the subjects section was insufficient. It was concluded that some of the students stated that they learned more easily with the EIN-supported teaching when some stated that it was useful to reinforce the subjects, the knowledge was more permanent because they were appealed to visuality, and the time they need for learning was shorter.

In the study by Tüysüz and Çümen (2016), students stated that it was beneficial to use the EIN to reinforce the subject, revise the subjects and prepare for the exams, and they were attracted with the contents. Aditionaly, they found that the students had occasional problems while sigining into the EIN system and the it took time to upload videos or cause some freezing problems with videos. Timur et al. (2017), in their study onthe EIN, researched the views of middle school students and concluded that most of the students use the EIN for revising the subjects and find the EIN system useful. Bertiz (2017), as well, in his study, conclueded that students stated theycould easily use the EIN and it was visually interesting to them. However, contrary to other studies, they stated that the system was not slow. In summary we can say that EIN supported teaching is more effective than general way of teahing, as it provides more oppurtunities for learning and interaction. In addition to it, the students indicated it made the topic easier and it is more enjoyful to attend the classs.

Suggestıons

The author suggests that the insufficiency of infrastructure and equipments in schools negatively effects the active use of the EIN in the classroom. For this reason, this problem in schools can be solved by eliminating internet connection problems. At the beginning of the semesters, brochures about the use of the EIN can be prepared and students can be informed about the EIN contents and applications. Also, the use of the EIN courses can be organized in the computer classes of the school or in public education centers for students who have difficulties while using the EIN. By giving information about the EIN to teacher candidates in Education Faculties at universities, they can be provided with subjectson increasing skills in developing e-contents and using technological tools. The EIN-related activities can be added to school books to makemore proactive use of the EIN. In addition to the EIN, similar applications such as geogebra and dynamic geometry software can be used to increase the impact of the EIN-supported geometry teaching. EBA-supported education can also be conducted at primary schooland secondary school level students. Comparisons can be made by applying similar studies in schools that accept students with or without an entry examination.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

Aktay S, Keskin T (2016). Eğitim Bilişim Ağı (EBA) Incelemesi. Eğitim Kuram ve Uygulama Araştırmaları Dergisi 2(3):27-44.

Altun M (2008). Ilköğretim ikinci kademede (6, 7 ve 8. sınıflarda) matematik öğretimi. 6.Baskı, Erkam Matbaacılık, Ankara, pp. 271-295.

Artun H, Kırıcı MG, Bakırcı H (2018). Eğitim Bilişim Ağı Destekli Eğitimin „Kuvvetin Ölçülmesi Ve Sürtünme" kavramlarının Öğrenilmesine Etkisi. Electronic Turkish Studies 13(3):142-154.

Bertiz Y (2017). Çevrimiçi sosyal eğitim platformlarının kullanılabilirliklerinin değerlendirilmesi: eğitim bilişim ağı (EBA) sistemi örneği. Bilim Eğitim Sanat ve Teknoloji Dergisi 1(2):62-76.

Bolat Y (2016). The flipped classes and educatıon ınformatıon network (EIN) Ters yüz edilmiş sınıflar ve eğitim bilişim ağı (EBA). Journal of Human Sciences 13(2):3373-3388.

Büyüköztürk Ş, Kılıç-Çakmak E, Akgün Ö, Karadeniz Ş, Demirel F (2008). Bilimsel araştırma yöntemleri. Pegem Akademi Yayınları, Ankara.

Can A (2017). Quantitative data analysis with SPSS. Ankara: Pegem Akademi Yayınları pp. 115-144.

Creswell JW (2008). Educational research: Planning, conducting, and evaluating quantitative. Upper Saddle River, NJ: Prentice Hall.

Creswell JW (2017). Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications, Beverly Hılls.

Çepni S (2010). Araştırma ve Proje Çalışmalarına Giriş, Celepler Matbaacılık, Trabzon.

Çiltaş A (2011). Eğitimde öz-düzenleme öğretiminin önemi üzerine bir çalışma. Mehmet Akif Ersoy Üniversitesi Sosyal Bilimler Enstitüsü Dergisi 3(5):1-11.

Çiltaş A, Yılmaz K (2013). Ilköğretim matematik öğretmeni adaylarının teoremlerin ifadeleri için kurmuş oldukları matematik modeller. Eğitim ve Öğretim Araştırmaları Dergisi 2(2):107-115.

Doruk BK (2010). Matematiği günlük yaşama transfer etmede matematik modellemenin etkisi. Hacettepe Üniversitesi, Eğitim Bilimleri Enstitüsü, Ankara, Doktora Tezi.

Education and Informatics Net (EIN) (2016). EBA Hakkında. http://www.eba.gov.tr/hakkimizda adresinden 27.06.2018 tarihinde alınmıştır.

Eryılmaz S, Salman Ş (2014). Fatih projesi kapsamında yer alan öğretmen ve öğrencilerin projeden beklentileri ve bilişim teknolojileri kullanımına karşı algıları. Elektronik Mesleki Gelişim Ve Araştırmalar Dergisi 2(1):46-63.

Hastürk G, Ballıel ÜB (2018). Fen bilimleri dersinde eğitim bilişim ağı (eba) kullanımının ortaokul öğrencilerinin akademik başarılarına etkisi. Uluslararası Beşeri Bilimler ve Eğitim Dergisi 4(7):327-342.

Kakmacı Ö (2009). Altıncı sınıf öğrencilerinin uzamsal görselleştirme başarılarının bazı değişkenler açısından incelenmesi. Osman Gazi Üniversitesi, Yayımlanmamış Yüksek Lisans Tezi.

Kayhan EB (2005). Investigation of high school students" spatial ability. Middle East Technical University, Eğitim Bilimleri Enstitüsü, Yayınlanmamış Yüksek Lisans Tezi.

Mc Millan JH, Schumacher S (2010). Research in education. Pearson Education Inc. New Jorsey, USA.

Olkun S (2003). Making connections: Improving spatial abilities with engineering drawing activities. International Journal of Mathematics Teaching and Learning 3(1):1-10.

Olkun S, Toluk Z (2003). Ilköğretimde etkinlik temelli matematik öğretimi. Anı Yayıncılık, Ankara.

Özlü T (2014). Bilgisayar yazılımları aracılığıyla oluşturulan 3-D sanal ortamların yatılı okullarda eğitim alan öğrencilerin uzamsal yeteneklerine etkisinin incelenmesi. Kastamonu Üniversitesi ,Eğitim Bilimleri Enstitüsü, Yüksek Lisans Tezi.

Taşpınar M (2017). Sosyalbilimlerde SSPS uygulamalınicelverianalizi. Ankara, PegemAkademiYayınları.

Timur B, Yilmaz Ş, Işseven A (2017). Ortaokul Öğrencilerinin Eğitim Bilişim Ağı (Eba) Sistemini Kullanmalarına Yönelik Görüşleri (EBA). Asya Öğretim Dergisi 5(1):44-54.

Turğut M (2007). Ilköğretim II. kademede öğrencilerin uzamsal yeteneklerinin incelenmesi. Dokuz Eylül Üniversitesi, Eğitim Bilimleri Enstitüsü, Yayımlanmamış yüksek lisans tezi.

Turğut M (2010). Teknoloji destekli lineer cebir öğretiminin ilköğretim matematik öğretmen adaylarının uzamsal yeteneklerine etkisi. Dokuz Eylül Üniversitesi, Eğitim Bilimleri Enstitüsü, Doktora Tezi.

Tüysüz C, Çümen V (2016). EBA ders web sitesine ilişkin ortaokul öğrencilerinin görüşleri. Uşak Üniversitesi Sosyal Bilimler Dergisi 9(27/3):278-296.

Yıldırım A, Şimşek H (2011). Sosyal bilimlerde nitel araştırma yöntemleri, Ankara, Seçkin Yayıncılık.