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THE EFFECT OF TECHNOLOGY INTEGRATION TRAINING ON GEOGRAPHY TEACHERS' PERCEPTIONS OF TECHNOLOGY INTEGRATION SELF-EFFICACY AND TECHNOLOGY ACCEPTANCE*

Teknoloji Entegrasyonu Eğitiminin Coğrafya Öğretmenlerinin Teknoloji Kabul ve Teknoloji Entegrasyonu Öz-Yeterlik Algılarına Etkisi

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Abstract

In this study, it is aimed to determine the effect of technology integration training on geography teachers' perceptions of technology acceptance and self-efficacy. In this sense, a training program entitled "Designing and Implementing Technology Integrated Activities into Geography Education" was developed. 13 activities, 2 of which were field studies and 11 were design and implementation were included in the program. The research was designed according to the mixed research method. The study group was composed of 29 geography teachers selected according to the purposive sampling technique. Data were obtained with "Technology Acceptance Measure for Teachers", "Technology Integration Self-Efficacy Perception Scale", teachers' opinions questionnaire form and interview form in the research. In the analysis of the data, one-way analysis of variance and descriptive analysis technique were used. As a result of the research, it was determined that the training program affected geography teachers' perceptions of technology integration self-efficacy significantly and positively. The qualitative data of the research also support the result.

Keywords: Geography Education; Technology İntegration; Geography Teaching Technologies, Geography Teacher

Öz

Bu araştırmada teknoloji entegrasyonu eğitiminin coğrafya öğretmenlerinin teknoloji kabul ve öz-yeterlik algısı üzerine etkisini ortaya koymak amaçlanmıştır. Bu amaca yönelik "Coğrafya Eğitimine Teknoloji Entegre Edilmiş Etkinlik Tasarlama ve Uygulama" başlıklı eğitim programı geliştirilmiştir. Geliştirilen programda 2'si arazi çalışması 11'i tasarım ve uygulama çalışması olmak üzere toplam 13 etkinlik yer almaktadır. Araştırma karma yönteme göre desenlenmiştir. Araştırmanın çalışma grubunu amaçlı örneklem tekniğine göre belirlenen 29 coğrafya öğretmeni oluşturmuştur. Araştırmada veriler "Öğretmenler İçin Teknoloji Kabul Ölçeği", "Teknoloji Entegrasyonuna Yönelik Öz-yeterlik Algısı Ölçeği", öğretmen görüşleri anket formu ve görüşme formu ile elde edilmiştir. Verilerin analizinde tek yönlü varyans analizi ve betimsel analiz tekniği kullanılmıştır. Araştırma sonucunda uygulanan eğitim programının coğrafya öğretmenlerinin teknoloji entegrasyonu öz-yeterlik algılarını anlamlı ve olumlu yönde etkilediği tespit edilmiştir. Araştırmanın nitel verileri de bu sonucu destekler niteliktedir.

Anahtar Kelimeler: Coğrafya Eğitimi; Teknoloji Entegrasyonu; Coğrafya Öğretim Teknolojileri, Coğrafya Öğretmeni

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INTRODUCTION

In 21st century, defined as the age of technology, a new technological product is added to the teaching process every day, and the use and integration of this product in the teaching process is the subject of researches in terms of different variables. However, technology integration is not only related with the use of technology, but also includes content and effective teaching practices. In this sense, the fact that any technology is used very often in a learning environment or that the technology itself is the focus of teaching should not mean that integration has fully accomplished.

Maddux & Johnson (2006) consider the integration of technology into education in two different approaches, Type I and Type II, taking into account the way technology is employed. Applications in Type I are considered to be the use of technology in education, and applications in Type II are accepted as the integration of technology in education. For example, a geography teacher studying a climate subject in Type I only shows climate diagrams to students through a presentation program. In the process of this practice, students are completely passive. In Type II, teacher guides the students in the lesson and gives them the opportunity to access the original source of climate data. Students organize the data they obtain, convert it into tables, graphs and diagrams (Şanlı, Sezer & Pınar, 2016). They take an active part in the process of applying the Type II approach (Perkmen & Tezci, 2011). In this regard, implementation of technology in education according to the Type II increases the students' ability to use technology.

When teachers hear education technology integration, they mostly perceive using PowerPoint presentations in class, showing images recorded in a computer by projecting them onto a screen, or using smart boards that exist in classrooms (Şanlı, Sezer & Pınar, 2016; Sezer, İnel, & Gökalp, 2020). Use of technology in this way is classified as Type I and the interaction of students with technology in these applications cannot go beyond watching. However, in order to implement technology into the educational environment, it is necessary to realize the practices in which students integrate with it.

It is recommended to use technology in the education system by integrating in curricula. In fact, digital competence is one of the competencies that are aimed to make individuals gain in the Geography Course Curriculum (GCC), which was started to be applied in 2005 and revised in 2018. The digital competence supported by use of computers in access to information and evaluation of it, its storage, production, presentation, exchange and basic skills such as connection to common networks and making communication via internet includes safe and critical use of information communication technologies for business, daily life and communication (MEB, 2018). In the same way, it is desired to provide students with some skills in addition to knowledge in GCC: geographical observation, studying in the field, geographical inquiry, time, change and continuity of detection, preparing and interpreting map, table, graphics and diagram and ability to use evidence. In the acquisition of these skills (Tas, 2008; Ülker, 2009; Ünlü, 2011), student activity becomes even more important in the education and teaching process.

Technology integration in teaching has an important role for providing a multi-learning environment; helping students with different learning styles and learning needs (Yeşiltaş, 2009; Yazıcı, 2015); making it easier to remember; embodying abstract things (Yaşar & Gültekin, 2009); saving time and simplifying the content of the topic to make it easier to understand (Işman, 2008; Doğru & Aydın, 2017). Considering the importance in the research conducted, a training program entitled "Designing and Implementing Technology Integrated Activities into Geography Education" was developed. It was aimed to determine the effect of the training program on geography teachers' perceptions of technology acceptance and self-efficacy. Three questions were tried to be answered within this purpose:

- Is there any difference before and after the program in the level of technology acceptance of geography teachers participated in the study?
- Is there any difference before and after the program in perceptions of technology integration self-efficacy of geography teachers participated in the study?

- What are the opinions of the geography teachers participated in the research on the developed and implemented technology integration-training program?

METHOD

In this study, mixed research method, which includes quantitative and qualitative research methods, was used. The quantitative dimension of the study was utilized by a one group pre-test and post-test quasi-experimental design. This design involves only experimental group, there is no control group (Akbay, 2019: 163). The main purpose of this design is to determine the changes that may occur in the dependent variable/variables. The qualitative dimension of the research was carried out by conducting a semi-structured interview and a focus group interview.

Study Group

In this study, purposive sampling technique was used to determine the study group. Criteria defining the purposive sampling were: "to have the ability to use the applications and tools in the basic level (such as GIS, WEB 2 tools) included education program, to have personal computer and to be volunteer". A total of 29 geography teachers, 13 females and 16 males, were determined as the study group.

Table 1. Personal Information of the Study Group

Variable	Category	f	%
Gender	Female	13	44.8
	Male	16	55.2
Graduated Faculty	Faculty of Education	15	51.7
	Faculty of Science and Letters	14	48.3
Assigned School	Anatolian High School	16	55.2
	Vocational High School	8	27.6
	Imam Hatip High School	3	10.3
	Other	2	6.9

Data Collection Tools

A four-part form was used to collect quantitative data of the research. In the first part of the form, questions aimed at collecting the personal information of the participants were included. In the second part, Technology Acceptance Measure for Teachers compromised of 38 questions, developed by Ursavaş, Şahin & McIlroy (2014), in the third part Technology Integration Self-Efficacy Perception Scale compromised of 19 questions, developed by Wang, Ertmer & Newby (2004) and adapted into Turkish by Ünal (2013) was used. The fourth part consisting of questions (16 closed-ended and 1 open-ended) aimed at obtaining the opinions of teachers participated in the training program on their achievements after the training was added to post-test activity. In addition, in order to understand the participants' experiences about the process in detail, a focus group interview was conducted with 9 teachers at the end.

Training Program of Designing and Implementing Technology Integrated Activities into Geography Education

Developed training program included 13 activities; 2 field studies, 4 GIS activities, 3 Web-based applications (Blog writing, Webquest, and Digital Portfolio preparation), and 4 WEB 2 tools (Gamification, Video preparation, Google Earth, and Google forms). Design and implementation activities for integration ways of software, applications, and tools especially related with

information sources provided by internet including computer, Office programs, WEB 2 tools, augmented reality applications, mobile applications and geographic information systems (GIS) into education and teaching process of geography were made.

Within the activities, it was aimed to provide

- using Office programs to convert information into new forms (written text into tables, graphs, and diagrams), generate information, and create videos
- accessing, receiving, organizing and converting accurate data from internet sources with Webquest applications,
- creating innovative and enriched learning environments that enable teacher-technology-student interaction with Web2 tools (Blogger, Kahoot, Google Forms, Google Earth),
- creating innovative and enriched learning environments by making GIS technologies a teaching-learning environment
- creating innovative and enriched learning environments by combining virtual and real with augmented reality application
- collecting data, evidence and make geographical observations that will be used in designing technology integrated activities with field studies
- geographical knowledge and skills expressed in GCC in a more powerful way thanks to innovative and enriched learning environments in which these technology-integrated activities are used.

In the training program developed in this context, technology-integrated activities and the contributions of these activities can be listed as follows;

Office programs are free of charge and have numerous functions in the educational process. In particular, Excel is one of the most basic Office programs. It can be used in educational activities, in many different areas of social and economic life. The program can convert textual information into tables, graphs and diagrams. It is aimed to prepare and interpret tables, graphs and diagrams by using Office Excel program and use evidence and develop observation skills with the Office Movie Maker (similar programs) program.

Webquests provide students with the opportunity to access information resources on the internet quickly and securely. Nowadays, surfing in the internet has become a necessity for people of almost all ages. Webquests prepared by teachers, as a part of their structure, allow students to access quickly the right resources on the subject that they research in accordance with the instructions given. Since the expected performance of the student is fully defined in the webquests prepared according to its structure, students know the ways of both learning the subject they are given and generating information on it.

Web 2 tools (Blogger, Kahoot, Google Forms, and Google Earth) allow creating student, teacher, and technology interaction. In this context, the student can be in contact with technology during the educational process. Thus, technology integration in Type II can be achieved.

GIS activities are indispensable for map literacy and map skills and spatial thinking skills that need to be acquired through geography lessons. In both skills, map studies and contact with the map are very important. Nevertheless, the fact is that students' contacts with the map during school hours take place in the form of looking at a pre-prepared printed or digital map. However, we also know that both skills can be gained at a high level by studying directly with the map or even making the map. Activities designed and implemented by using GIS provide students with the opportunity to access, receive, organize, analyse geographical data, as well as use it in accordance with its purpose and present it in a new form. It is aimed to make them gain all aspects of map skills with GIS activities.

Augmented reality (AG) is defined as a technology which real-world elements and the virtual world are integrated with the possibility of interaction between real and virtual objects (Azuma, 1997). Augmented reality offers the opportunity to synthesize virtual and real information meaningfully (Klopfer, 2008). When it is not possible to go to the real field in the educational process, augmented reality applications allow bringing the field to the classroom in a digital environment.

With field trips that will be made, it is aimed to gain the skills of using the necessary tools and technologies, which is an important part of the ability to study, collecting and recording data in the field. The activities to be held after the trip are aimed at supplying the skills of analysing data, making conclusions, developing recommendations by using technology.

Before implementation process of the developed training program, the study group was contacted online. Preliminary information about the activities in the training program and the software, applications and tools to be used in these activities was given. Training program was planned as 5 days and 13 sessions, it was held in Uşak between 6-10 September 2021. The activities included in the training program were carried out by specialists in their field (7 academicians in geography, 1 in computer sciences, 1 in communication, 1 in history).

Analysis of the Data

Jamovi 1.2 package program was used to analyse the quantitative data obtained in the study. Before proceeding to the analysis of the data, the normality distribution was examined with the Shapiro-Wilk test. As a result of the analysis, one-way analysis of variance with t test was used for dependent and independent groups of parametric tests considering that the normality assumption was provided because the significance value was higher than 05. When homogeneity was not achieved during the analysis of variance, Welch test was applied and the findings were reported. The qualitative data were analysed by descriptive content analysis, which is a type of analysis that allows revealing the facts hidden in the data (Yıldırım & Şimşek, 2013). Firstly, the answers given by the teachers to each question in the semi-structured interview and focus group interview were transferred respectively according to the form prepared by the researchers. Each researcher made pre-reading and then came together to decode in accordance with the nature and purpose of the study. The data obtained after coding were presented in the findings section descriptively in relation to research problems. Direct examples were given in accordance with the teachers' opinions. The percent concordance between the researchers was calculated in the decodings determined in the content analysis. The percent concordance was calculated as "Reliability = Concordance / (Concordance+ Discordance) x 100" (Miles & Huberman, 1994) 83%.

FINDINGS

In order to answer the first question of the study, the technology acceptance levels of the teachers participated in the study were examined before and after the training program. In order to see whether the pre-test and post-test scores of the teachers' from Technology Acceptance Measure differed, a t-test was performed for the dependent groups. The findings are presented in Table 2.

According to the participants' results of the t-test conducted to compare their pre-test and post-test scores for technology acceptance, there is no difference between the pre-tests and the post-tests ($t_{(28)}$=-1,875; p>.05). It may be due to the fact that the purposive sampling technique was used in the selection of the study group. Considered criteria in order to be participant in the study require that they "know and use technology". High pre-test scores explain this situation.

Table 2. Comparison of Participants' Pre-test – Post-test Scores from Technology Acceptance Measure

Measure	N	X̄	S	Sd	T	P
Pre-test	29	4,00	,314	28	-1,875	,071
Post-test	29	4,11	,337			

In order to answer the second question of the study, the self-efficacy perceptions of the teachers regarding technology integration were examined before and after the training given in the process. In order to see whether there is difference between the pre-test and post-test scores of the teachers from Technology Integration Self-Efficacy Perception Scale, a t-test was performed for the dependent groups. The findings are presented in Table 3.

Table 3. Comparison of the Pre-Test and Post-Test Scores of the Participants from *Technology Integration Self-Efficacy Perception Scale*

Measure	N	X̄	S	Sd	T	P
Pre-test	29	3,78	,761	28	-5,587	,000
Post-test	29	4,35	,549			

It is clear in the table that there is a significant difference in favor of post-tests ($t_{(28)}$ =-5,587; p<.05) according to the t test results conducted to compare participants' technology integration self-efficacy perception pre-test and post-test scores. Findings confirm that the technology integration-training program was effective. Teachers' views obtained through the questionnaire form regarding the training are given in Table 4.

Table 4. Teachers' Views on Education Program After Training

		Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree	Result
I have learnt new things about technology integration.	f	19	3			7	29
	%	65,5	10,3			24,1	100
My awareness of technology integration into geography education has increased.	f	20	2			7	29
	%	69	6,9			24,1	100
I feel myself lucky to have participated in this training.	f	20	2			7	29
	%	69	6,9			24,1	100
I will create a blog page after this training.	f	15	8	2		4	29
	%	51,7	27,6	6,9		13,8	100
I will prepare Webquest for my students after this training.	f	18	8			3	29
	%	62,1	27,6			10,3	100
I will prepare a digital portfolio for myself.	f	15	8	3	1	2	29
	%	51,7	27,6	10,3	3,4	6,9	100
I think I can create short documentaries for my classes.	f	18	7	1		3	29
	%	62,1	24,1	3,5		10,3	100
I can use gamification applications in my classes.	f	19	7			3	29
	%	65,5	24,1			10,3	100
I can use the Google Earth program to make a virtual trip in my classes.	f	19	7			3	29
	%	65,5	24,1			10,3	100
Activities show me that GIS can be used at different stages of geography education.	f	17	8		1	3	29
	%	58,6	27,6		3,448	10,3	100
I can use digital concept maps in my courses.	f	19	7			3	29
	%	65,5	24,1			10,3	100
I can use the augmented reality application in my classes.	f	21	5			3	29
	%	72,4	17,2			10,3	100
I think that I can give more place to technology in my classes.	f	21	5			3	29
	%	72,4	17,2			10,3	100
If I had not come to the trainings, I would have missed a lot about technology integration in education.	f	25	1			3	29
	%	86,2	3,45			10,3	100
From now on, I will use what I have learnt in the training frequently in teaching geography.	f	26			1	2	29
	%	89,7			3,448	6,9	100
The training has created new ideas for me about teaching geography.	f	21	5			3	29
	%	72,4	17,2			10,3	100

It is seen that most of the participants are satisfied with the training and they have acquired new knowledge and skills about technology integration into geography education. Most of the geography teachers (89.7%) who participated in the study said that they would apply the achievements they had gained in the training program in their professional lives.

About 90% of the teachers stated that they would use the technological tools used in the training program in the future in geography classes. Answers of the participants to the open-ended question *"if you have any other opinions about the training program, please write below."* were added at the end of the questionnaire form;

> "*-Among the TUBITAK trainings I have attended, it is the best one that serves the current needs of my field most. I am very happy to have learnt new programs in which I can involve my students in my courses, increase interest in geography class, and I can do my job with pleasure.*"
>
> "*-It was a very useful, nice and promising program.*"
>
> "*-Everything was very nice and useful, I'm glad to have come. I would like to thank all our educators who have worked hard for everything.*"
>
> "*-It was satisfactory. I would like to express my eternal thanks to the whole team. I think it has contributed quite a lot to my profession.*"
>
> "*-The training was excellent for me. From all the educators who have worked in training, I have learnt many memories related to my profession. I have gained many achievements in terms of integrating technology and geography integration into the courses.*"

Technology integration shows that the training program is successful and has achieved its goal. The only criticism received from the participants about the training program is that the duration of the program is short. Most of the teachers recommended allocating more time for activities.

After the training, a focus group interview was conducted online with the participating teachers (5 Males and 4 Females). According to the results obtained from this interview; all of the participants found the five-day training useful and stated that the activities they participated met their expectations at a sufficient level. Achievements of the training program according to participants were: "1) to get the opportunity to work in academician-teacher, teacher-teacher collaborative environments 2) to develop and experience practices that provide technology integration in geography courses 3) to create activities based on GIS. 4) to realize the functions of Web 2.0 tools 5) to prepare enriched activities in geography courses.

Most useful activities in the training program according to participants were: 1) Map studies with QGIS Software 2) Creating Blog 3) Field Study in Virtual Environment (Google Earth) 4) Augmented Reality Activity 5) The activity title of which is We Prepare an Exam/Quiz for Distance Education: Google Classroom. There are some issues that participants suggested revising; 1) The duration of preparing historical geography documentary activity should be extended 2) It should be ensured that the levels of participants are close to each other in GIS activity 3) ArcGIS and QGIS activities should be given more time. 4) Number of the activities in the same day should be decreased.

In addition, the participants listed the reasons for recommending this project to their friends in the future as follows: 1) It is a project that has contributed to the teachers. 2) All the teachers in Minister of National Education (MNE) need such kind of projects and trainings. 3) Other geography teachers also need to see how they can use technology in their lessons. 4) There are many programs to learn about the integration of technology into geography education. 5) Thanks to such projects, it is possible to open new horizons for teachers and students. 6) This project carried out about the use of technology in geography courses, has presented a comprehensive and content-rich training.

DISCUSSION, RESULT AND SUGGESTIONS

In this research, it is aimed to identify the effect of technology integration training on geography teachers' perceptions of technology acceptance and self-efficacy. For this purpose, a training program including designing and implementing

activities based on technology integration was developed by researchers, and it was carried out by specialists in the field with 13 activities (2 field studies, 11 design and implementation activities) in five days. Pre-test score of the participants from technology acceptance measure is 4.00, and post-test score is 4.11 (the lowest point 1, the highest point 5). Although the score in post-test increased, it is not significant statistically. The reason of it is thought, as pre-test scores of the participants are high. This case is related with study group. The fact that proficiency of using technology of the teachers selected by purposive sampling method is higher than average is reflected naturally on their level of acceptance to use technology. In recent studies (Karaoğlan Yılmaz & Binay Eyüboğlu, 2018; Sarıkaya, 2019; Akturk & Delen, 2020), similar results have been found regarding the high level of technology acceptance of teachers. In this context, it is thought that teachers' frequent use of technology in their professional lives in recent years may affect their tendency to accept technology. On the other hand, the trainings that teachers received during the undergraduate period may also have a positive effect on their technology acceptance levels. There are studies in the literature supporting this discourse. For example, Alım (2015), in his study with 367 preservice geography teachers, found that participants' taking instructional technologies and material design courses had a positive effect on their ability to use technology. In a study conducted by Şanlı & Bostancıoğlu (2020) with 140 geography teachers, it was found that teachers who took instructional technologies and GIS courses during the undergraduate period had a higher proficiency in using technology.

According to another finding obtained from the research, there is significant difference in favor of post-test scores when the geography teachers' pre-test scores for perceptions of technology integration self-efficacy are compared with post-test scores after training. In other words, teachers' perceptions of technology integration self-efficacy which is low before the program increased after they participated in the technology integration training program. This finding confirms effectiveness of the training program. In their study they carried out with 280 preservice teachers, to increase perception of technology integration self-efficacy, Wang et al., (2004) stated that the experiences and practices of the participants increased their perceptions of technology self-efficacy. Yıldırım & Ünlü (2021) found that the training program implemented as a result of the technology-supported in-service education program for geography teachers increased their ability to use technology. In this sense, the findings overlap with the results of the literature. The results obtained from the quantitative data also support the qualitative data. The geography teachers participated in the training program stated that it provided positive achievements for them. Thanks to the technology integration training, they have said that they can integrate different applications and tools into the teaching process of their courses. In addition, the fact that the training was given by geography educators was found positive and beneficial by the teachers. According to Arslan & Şendur (2017), training given by specialists in the field increases satisfaction level of the participants. The studies conducted in the literature point out that the technical difficulties related to technology integration in education have been largely overcome today, but new needs have emerged with updated technologies (Arslan & Şendur, 2017; Şanlı, et al., 2016). Consequently, it may be recommended to design and implement training programs by determining the needs of teachers to use renewed technology tools in the future.

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