

Teachers' opinions about technological pedagogical content knowledge used in geography lessons

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Abstract

Technology is used in every country in the world, in every field. The number of technology-supported trainings in which students are active is increasing day by day. Computers and the Internet are the most widely used technologies in geography lessons today, as in every field. In this research, it is aimed to determine which technologies are used in geography lessons; how often these technologies are used; and if there are problems experienced in this process, what are they. In order to achieve this aim, open-ended questions were applied to 12 geography teachers working in 12 different schools and 40 students taking this course. As a result of the study, it was concluded that the technological tools used in geography lessons are limited. It is stated that among the problems experienced by the teachers, the infrastructure of the school is not suitable for technological tools, and the deterioration in technological tools creates problems. It was concluded that teachers frequently use technological tools. It has also been concluded that the most used technological tools are smart boards and projection devices. The results for the students are quite sad. Students stated that they want to use technological tools more frequently in their lessons and that their learning is more permanent in this way.

Keywords: Geography, technology, competence, assessment and evaluation, student, geography teacher, education;

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1. Introduction

It is very important to raise individuals who can follow the characteristics of the age and society we live in. This can be possible by raising individuals who are knowing and practical. The way to raise well-equipped individuals is through well-equipped educators who know today's conditions and know information and technology (Curtis, 2019; Öner, 2020).

Technology is one of the most important elements in shaping the information age of the 21st century. Technology is the cornerstone that enables the establishment and shaping of the information age (Güleç, 2021; Karademir, 2015). At a time when technology has increased so much, the fact that education and training remain devoid of technology can affect the effectiveness of education (Cook, Warwick, Vrikki, Major, & Wegerif, 2019). During this period of creating technology-connected individuals, education and technology-averse educators are not enough to meet the growing opinions of individuals. In today's world, technological tools are used in homes, workplaces, in short, in all areas of life (Mitchell, Roy, Fritch, & Wood, 2018; Pamuk, Ülken, & Dilek, 2012). Education is another area where technology is used extensively and intensively (Öğretmen & Akman, 2019). Today, technology and technological tools are used in the education of children and adults inside and outside of school. The use of technology in learning environments provides students with richer learning situations, stimulates interest, places the student at the heart and increases their motivation towards lessons (Aliman, Astina, Putri, & Arif, 2019; Bondarenko, Pakhomova, & Zaselsky, 2019; Karademir, 2015).

The use of technology in education is now inevitable. Many countries are now making serious investments to harness technology in education. In order for these investments to achieve their goals, practice and research must be carried out to enable candidates and teachers to develop effective knowledge regarding the integration of technologies in their fields (Baran & Bilici, 2015). As it is about the development of technology, it is clear that the use of technology in education can only increase success if the effective use of teachers is ensured (Çiftçi & Dikmenli, 2018; Erden & Uslupehlivan, 2020; Öner, 2020).

According to Mishra and Kohler (2006), technological pedagogical content knowledge is the knowledge and skills teachers need to effectively integrate technology into their teaching practices. It is a model of teacher knowledge in which current developments are integrated with technological knowledge. Therefore, the use of technology in education does not reduce the role of teachers, but on the contrary, it increases it.

1.1. Technological pedagogical knowledge (TPK)

TPK, specifically technologies, allows to understand how the teaching and learning processes can change when it is used in different ways. In relation to this, disciplined and developmentally appropriate teaching design and strategies are developed. It addresses pedagogical relationships and limitations of technological tools (Koehler & Mishra, 2009). It is necessary to have technological knowledge of the field and to have some functionalities; must be able to use technology to implement different teaching–learning methods (group work, collaborative method, problem-solving etc.); must be able to relate conceptual knowledge and technology in educational processes and transfer training; and must be able to carry out a technology-based assessment process to assess student achievement per subject (Demirezen & Keles, 2020).

Teachers with technological pedagogical content knowledge (TPACK) can present regular information and versatile information by using more technological tools in their classrooms. Teachers who understand the cognitive levels of students and make explanations in this sense provide examples, use analogies and different teaching strategies and can better present information. TPACK is a newly acquired knowledge type that goes beyond the three main components, including the interaction between content and parts. It is important to ensure the integrity of the course content to be taught by supporting technology and appropriate pedagogical methods.

1.2. The importance of the research

In terms of the content of the geography course, it is quite suitable for benefiting from and using technology in terms of purpose and achievement. It has been found that the use of technology in the geography lesson will help permanent learning and increase attention and motivation (Aktekin & Çoban, 2012; Çiftçi & Dikmenli, 2018; Dikmenli & Ünaldi, 2013; Dündar & Ünaldi, 2020; Kesler, 2007; Russell, 2007). For this reason, it is important to determine which technologies are used in geography lessons; how often these technologies are used; and if there are problems experienced in this process, what are they.

1.3. Purpose of the research

Technology is used in every country in the world, in every field. The number of technology-supported trainings in which students are active is increasing day by day. Computers and the Internet are the most widely used technologies in geography lessons today, as in every field. In this research, it is aimed to determine which technologies are used in geography lessons; how often these technologies are used; and if there are problems experienced in this process, what are they. Within the scope of this general purpose, answers were sought for the sub-objectives: 'which technologies are used in geography lessons; how often technologies are used in geography lessons; and are there any problems caused by technologies used in geography lessons'.

2. Methods

Qualitative research methods have started to gain the importance they deserve in the field of social sciences in recent years. The philosophical and scientific changes that took place in the 21st century leave the framework of positive studies in the field of social sciences and create a more structural and post-structural framework. Qualitative data analysis is a classification and interpretation process to make sense of the studied data and develop explanations for what is shown in the data set (Çelik, Baykal & Memur, 2020). The case study method, in which a certain situation is examined with a holistic approach from the qualitative research design, was used (Shufutinsky, 2020).

2.1. Research questions

Questions were asked in order to determine the technological content knowledge that geography teachers use in their lessons. Regarding the state of using technology, they were asked about which technologies they use, how often they use it and the problems they experience while using technology.

- Which technologies do you use in geography lessons?
- How often do you use technological tools in geography lessons?
- Do you have any problems with the technological tools you used in the geography lesson?

Forty students were included in the study to determine the effect of teachers' use of technology related to their technological content knowledge in geography lessons on students' success. Students who took geography lessons were asked questions about their teachers' technological knowledge.

- Do you think your geography teacher uses technology adequately?
- How do the technological tools you use in the geography lesson contribute to your learning?

2.2. Research group

In order to reach the participants of the research, open-ended questions were applied to 12 geography teachers working in 12 different schools and 40 students taking this course. Purposeful sampling is where knowledgeable individuals are selected by the researcher in order to obtain data about an event or phenomenon as the sample of the study (Babbie, 2020). Demographic information of the sample is shown in Table 1.

Table 1. Demographic characteristics of the research group

Teacher	Features	N
Gender	Female	7
	Male	5
Age	22–27	3
	28–33	5
	34–39	4
Professional seniority	1–3	6
	4 or more years	6

When the demographic characteristics of geography teachers were examined, seven female and five male teachers were included in the study. There are 3 teachers aged between 22 and 27; 5 teachers aged between 28 and 33; and 4 teachers aged between 34 and 39. Considering the professional seniority levels, 6 teachers had a seniority of between 1 and 3 years and 6 teachers had a seniority of 4 or more years.

2.3. Data collection tools

In the study, open-ended questions prepared by the researcher were asked for the detailed analysis of geography teachers' views on technological content knowledge. 3 questions prepared by the researcher and finalised by taking the opinions of 3 experts and making additions were determined as research questions.

3. Results

3.1. Technologies used in geography lesson

Table 2. Technologies used by geography teachers in their lessons

Thema	N
Smart board	8
Projection	7
Mobile phone	6
Computer	3

When the findings about which technologies are used by geography teachers in their lessons, it is seen that they use smart boards the most. Seven teachers stated that they used a projector; six teachers stated that they used a mobile phone; and three teachers used a computer.

Some of the examples of the opinions of the teacher candidates are as follows:

'Projection is the technological tool that I use the most in my geography lesson. I also use the smart board from time to time'.

'The smart board is the tool I use most often in accordance with my course content. Of course, I also use mobile phones for some applications. I do not use the applications on the mobile phone, especially when I do assessments'.

3.2. Findings on the frequencies of technologies used in the geography course

Table 3. Frequencies of technologies used in the geography course

Thema	N
Once a week	5
Twice a week	5
Once about everything	1
At the end of the unit	1

When we look at the findings regarding the frequency of the technologies that geography teachers use in their lessons, there are eight teachers who stated that they use it once a week, five teachers who say that they use it twice a week, one teacher who stated that they use it once during each lecture and one teacher who said that they use it only once at the end of each unit.

Some of the examples of the opinions of the teacher candidates are as follows:

'I use technology as much as possible in my classes. I use at least one technological tool in every lesson'.

'I can't teach in a classroom where there is always a smart board. For this reason, I can teach my lesson once in every subject in a class where there is a smart class. Since the infrastructure of our school is not suitable, I cannot use technology much, even if I wanted to'.

3.3. Problems while using technological tools

It was asked what were the problems experienced by the geography teachers with the technological tools they used in their lessons. From the results of this finding, four teachers stated that the infrastructure of the school was not suitable; three teachers stated that they had difficulties in adapting technological tools to their lessons; and three teachers stated that they had difficulties because they did not know the new device and application software. On the other hand, two teachers stated that there was a problem with technological tools, and in this case, they had a problem because the lesson was disrupted.

3.4. Whether the students find the technology used in the lessons sufficient or not

Interviews were held with 40 students who took geography lessons. 30 students stated that they did not find it sufficient from the answers they gave to the finding about whether the technological tools used in geography lessons were sufficient or not. 10 students found it sufficient.

Some of the examples of the opinions of the teacher candidates are as follows:

'While technology is so advanced, there are technological tools everywhere, and we rarely use these tools in the classroom. School grades are not available'.

'Our teacher does the straight lectures more. We do not use technological tools often'.

3.5. Contribution of the technological tools to learning

The students were asked how the technological tools they used in the lesson contributed to their learning. When we look at the findings related to this question, there are 21 students who stated that their learning increased when the expression was provided using technological tools. 12 students stated that the lessons became enjoyable and fun, thanks to technological tools. Seven students stated that their motivation and interest increased.

4. Discussion and conclusion

In order to determine the technological competencies of geography teachers, interviews were conducted with the teachers. First of all, regarding the demographic characteristics of geography teachers, seven female and five male teachers were included in the study. There are 3 teachers aged between 22 and 27; 5 teachers aged between 28 and 33; and 4 teachers aged between 34 and 39.

Considering the level of professional seniority, 6 teachers with a seniority between 1 and 3 years and 6 teachers with a seniority of 4 years or more participated in the research.

In order to determine the knowledge of geography teachers about technology products, it was first asked which technologies they used in their lessons. When the results of this finding are examined, it can be concluded that the most frequently used tool was the projection, followed by smart board. It was concluded that there are teachers who use phones and computers. When the results of this finding are examined, it is seen that geography teachers generally choose the same technological tools.

When we look at the results of the findings regarding the frequency of technologies used by geography teachers in their lessons, there are eight teachers who say that they use it once a week, five who say that they use it twice a week, one who says that they use it once in every lesson and only once at the end of each unit. In the studies carried out, it was emphasised that the process of integrating technology in education is not only the task of the teacher, but that the whole team is responsible for it – from technical support to school management (Orhan, 2015).

It was asked what the problems experienced by the geography teachers in the technological tools they use in their lessons. As a result of this finding, four teachers stated that the infrastructure of the school was not suitable. Three teachers stated that they had difficulty in adapting technological tools to their lessons. Three teachers stated that they had difficulties because they did not know the new device and application software. On the other hand, two teachers stated that there was a problem with technological tools and in this case they had problems because the lesson was interrupted. This is very thought provoking. It is seen that technological tools are not used frequently.

As a result of the findings, when the results regarding the problems experienced by the geography teachers while using the technological tools were examined, it can be seen that they experienced problems arising from the insufficient infrastructure of the school and they had difficulty in adapting technological tools to their lessons. It can be said that this situation is due to the lack of training they received at the university or the fact that they did not receive enough in-service training. Three teachers stated that they had difficulties because they did not know the new device and application software. On the other hand, it was concluded that two teachers had a problem with technological tools and, in this case, they had problems because the lesson was interrupted.

As a result of the studies conducted with the students, interviews were conducted with 40 students who took the geography course. 30 students stated that they did not find it sufficient from the answers they gave to the finding about whether the technological tools used in geography lessons were sufficient. On the other hand, 10 students stated that the technologies they used in their lessons were sufficient. The results obtained from these findings show that the students did not find the technology used in their lessons to be sufficient.

The students were asked how the technological tools they used in the lesson contributed to their learning. When we look at the result of this finding, there are 21 students who stated that their learning increased when expression was provided using technological tools. 12 students stated that the lessons became enjoyable and fun, thanks to technological tools. Seven students stated that their motivation and interest increased. These results are very pleasing. Technology is an effective tool in education and provides permanent learning. Yapılan araştırmalar sonucunda (Bondarenko, Mantulenko, & Pikilnyak, 2019; Karadeniz, Baneres, Rodríguez, & Guerrero-Roldán, 2019; Özüpekçe, 2014; Turan, Meral, & Sahin, 2018) bilgisayar destekli coğrafya öğretiminin öğrencilerin başarıları ve tutumları üzerinde olumlu etki yaptığı sonucuna ulaşılmıştır.

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