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USE OF WEB-BASED GIS APPLICATIONS IN GEOGRAPHY TEACHING—THE IMPLICATIONS FROM TÜRKİYE

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Abstract: Geography, as a discipline which examines the earth, aims to increase analytical thinking skills by instilling spatial thinking (ST) skills in students. The youth who enrich a sense of space with these talents will effectively solve the spatial problems they encountered. In the modern world, where spatial issues are frequently being faced with, ST is extremely important for analyzing and interpreting data. Geographical information systems (GIS) appear as a method commonly used to process data and transform it into spatial information. In this context, despite the renewal of the secondary education (SE) geography curriculum in Türkiye, with the components required for the use of GIS at the SE level, prevented the use of GIS in SE from reaching the desired level. Developments in technologies have also caused significant changes in the field of GIS with the power of cloud technologies and, the work done in the personal computer environment has been moved to the internet environment. Web GIS applications, which can be used via a web browser, are much easier to use than desktop software and can reach many users from any device with the internet. Within the scope of the study, a sample application was designed to use web GIS tools in geography teaching. With the application, it is possible to assess the students' achievements in the geography lessons regarding verbal and spatial data. Thus, it was aimed to ensure the active participation of the students in the geography lessons, develop their ST ability, and perception of space.

Keywords: teaching geography; spatial thinking; cloud computing; web GIS; Türkiye

1. Introduction

There have been significant developments from the past to the present in the methods of geography's handling of space. The science of geography began to examine the place by describing it and continued to do it in the 18th and 19th centuries. Having witnessed systematic and regional approaches in the 20th century, it switched to analytical methods based on problem-solving (Hardwick & Holtgrieve, 1996). Thus, geography has evolved into a human-oriented science that contributes to the solution of spatial problems by asking questions such as where and why the events occurring on the earth are located and how they interact with other elements, rather than memorizing and describing the different features of the earth. In this context, due to the data structure used in solving the spatial problems we face,

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Geographic Information Systems (GIS), which manages spatial data, have started to be used as an essential research method in geography. GIS is a method used in the collection, storage, and analysis of physical and human geography data today (Turođlu, 2011). It is used in many areas, from health to military applications, from disaster management to engineering studies, from logistics to geographical marketing. All these developments have made it possible to include the use of GIS in the achievements of the geography course curriculum in Türkiye (Republic of Türkiye Ministry of National Education [MEB], 2018, 2022). The inadequacy of applying GIS courses in undergraduate geography programs in Türkiye limits the ability of preservice geography teachers to use GIS tools. Although applied GIS courses in undergraduate geography programs have increased in recent years, they have not yet reached the desired level in all departments. Applied GIS courses are elective in many departments, which results in not all the students being able to use GIS. In addition, since undergraduate geography programs in Türkiye consider the verbal score in the university entrance exam, the students who enter the geography departments do not prefer to apply for GIS courses with a predominant numerical aspect.

Moreover, most current geography teachers did not do applied GIS courses in their undergraduate education. In the research, it has been determined that the technology self-efficacy of the geography teachers in Türkiye is moderate. They mostly use computers to create tables and graphics, write articles, and do research on the Internet (Gençtürk et al., 2012). All these problems cause that secondary education (SE) geography teachers and students in Türkiye are not able to provide adequate adaptation to geographic information technologies. However, when we look at the household information technology usage surveys, it has been seen that the rate of the Internet use in Türkiye is 79% in the age group of 16–74 in 2020, while the rate of mobile phone use is 92.2% of the population of Türkiye (Turkish Statistical Institute [TÜİK], 2020). Among these rates, it has been observed that the level of use of technological products by secondary school students is higher than that of adults, and the adaptation period is shorter (Kaya et al., 2014). Besides, secondary school students' interest in computer programming and robotic coding has been increasing rapidly in recent years (Korucu & Taşdöndüren, 2019). This application, which was designed with web GIS tools within the scope of the study, aims to integrate GIS tool into geography acquisitions in lessons for geography teachers who have difficulty using desktop GIS software. At the same time, it aims to improve the spatial thinking (ST) ability of secondary school students by highlighting their technology predispositions and potentials, to increase their interest in geography lessons, active participation, and perception of space. From this point of view, it becomes easy for students and teachers to use GIS in geography teaching where technology literacy is high. As in higher education geography teaching, geographic information based on the principle of cause-effect distribution and synthesis, teaching it with a GIS-supported and student-centered teaching approach will make it easier to reach the desired goal in SE geography teaching (Özgen & Çakıcıođlu, 2009). At the same time, transferring GIS applications to web and mobile platforms and including them in the geography curriculum, by increasing students' use of GIS in lessons ST about the environment in which they live in establishing the relations of geographic knowledge and spatial literacy, it appears to be an effective teaching tool (de Miguel González & de Lázaro Torres, 2020).

1.1. GIS in geography teaching

In general, curriculum is prepared for students to decide what they should know and how they should use the subjects in their lives (Değirmenci & İlter, 2013). However, for students, the targeted skills in these programs also need to be met in life. Learning in this way will also facilitate the knowledge acquisition. In order for this knowledge, which will be acquired by the student, to be applied in life, it is necessary to start from the nearby geography first. Namely, the student should first recognize their place, establish a connection between the critical points in the space, and ask questions about what is happening around them in a cause-effect relationship. Contrary to the rote learning approach, which was planned to teach geography with the constructivist curriculum prepared in 2005, it provides students with the skills of questioning, analytical thinking, making comments, and, most importantly, understanding the place they live in (MEB, 2018). In the SE geography curriculum (EGC), students should be able to apply what they have learned in the decision-making processes in the place where they live. In addition, EGC prepared in 2005 generally focused on raising students' geographical awareness.

Today, technological developments that make life easier have brought about the use of geographical data in many areas. The evolution of mobile phones into innovative technologies, the gradual emergence of autonomous vehicles, and the transfer of communication channels to web technologies have increased the importance of geographic data. With the acceleration of such technological developments, the materials used in education have also diversified. This situation has led to the increased use of different spatial technologies such as GIS, Remote Sensing, Global Positioning Systems (GPS), and Virtual and Augmented Reality applications in schools. The increase in technological opportunities in schools has brought teachers and students to be intertwined with these technologies and has significantly changed the way lessons are taught. The share of spatial technologies in geography teaching, in which active teaching practices such as inquiry-based learning and problem-solving activities take place, is gradually increasing all over the world, especially in Europe and the United States (Bednarz & van der Schee 2006; Chen & Wang, 2015; Demirci et al., 2018; de Miguel González & de Lázaro Torres, 2020; Milson et al., 2012). In line with these developments, GIS comes to the forefront as a teaching tool that answers the questions of "what, where, how, and why" with its analytical approach in geography teaching (Aksoy, 2004; Artvinli, 2009; Yomralıoğlu, 2000). GIS is so important in geography teaching because it has factors such as inquiry-based learning, visual-spatial understanding power, the power to use geographic data to define spatial relationships, and increased analytical thinking skills (Artvinli, 2010). However, the use of GIS in geography teaching in Türkiye has not developed enough due to technical equipment inadequacies in schools, difficulties in obtaining data, lack of qualified personnel, and the scarcity of applied geography lessons in SE (Artvinli, 2009; Şimşek, 2008).

The developments in internet technologies in recent years have affected GIS and all sectors. According to Kavzoğlu and Şahin (2012), cloud computing, which is the model of getting service by connecting to other servers over the Internet without the need for any software and storage unit via desktop computers, tablets, or smart mobile devices, has enabled the transfer of local studies to the internet environment. Access to hardware, software, and data, which are the basic components of GIS, has become easier thanks to cloud computing. Thus, dynamic maps, web and mobile applications have replaced the static maps. Depending on the development of the internet infrastructure, many operations done in desktop GIS have become available on web

browsers, and the concept of web GIS has emerged. Web GIS emerges as a new approach that removes the distance problem between people and access to applications and allows people to interact globally and instantly access information (Fu, 2016). Web GIS, with its advantages such as ease of use, global access, rapid design tools, group work opportunity, minimum hardware need, and fast access to current data, has managed to attract the attention of secondary school students as well as many segments of the society (de Lázaro Torres et al., 2016; Hong, 2014; Manson et al., 2014; Slocum et al., 2008). This has enabled us to gain an essential tool for effective and interactive classroom education (Bodzin & Anastasio, 2006; Henry & Semple, 2012; Milson, 2011; Schultz et al., 2008). Web GIS studies come to the fore in terms of increasing students' understanding, learning, and reasoning abilities, both in classroom activities and in workshops and extra-curricular activities. In particular, the use of web GIS in geography lessons has made web GIS an important agenda today so that students can read the geography they are in, understand the position of their geography in the world, be aware of the geostrategic position of their country, and establish a relationship between the causes and consequences of natural events. Web GIS, which has been mentioned frequently in recent years, first emerged in the early 1990s with the example of Xerox Parc Map Viewer, which provides interactive content (Davis, 1995; Putz, 1994). Similar applications that emerged in these years, when interactive maps began to enter our lives, constitute examples of the use of web GIS (Worldwide Earthquake Locator, WebGIS, GLOBE, KanCRN, Google Earth, and Journey North) in geography teaching in the world (Baker, 2015; Fargher, 2018; Patterson, 2007). The introduction of GIS on the web provides significant opportunities in student-centered teaching for geography teaching by removing barriers such as software installation and limited hardware capacity. Smart mapping, open-source data, and web-mobile applications offer geography teachers a wider field of study in using web GIS in schools (Fargher, 2018). Esri ArcGIS Online (2022) and the free, open-source QGIS Cloud products that enable these essential tools are typical examples of web GIS.

1.2. Smart mapping

The concept of smart mapping, which enables users to design visually impressive and useful maps quickly and easily, has emerged with web GIS. Smart mapping offers new and easy ways to set the symbology of data and proposes "smart" defaults (Fu, 2016). Smart mapping, continuous color transitions, and proportional symbols improved categorical mapping, to use of heatmaps and transparency effects, it offers more detail on data in new ways and a user-friendly interface (Esri, 2022). Unlike traditional software default features, smart mapping quickly analyzes data in many ways; it suggests correct defaults when adding layers and changing symbolic fields. Smart mapping enables a beginner user to easily create web maps without dealing with complex techniques in desktop GIS software. With all these features, smart mapping provides an important advantage for teachers to use GIS in SE.

1.3. Open-source data

Geographical data are an essential component in querying and analyzing spatial relationships. Today, with the developing technology, the volume and diversity of geographic data have increased, and access to geographic data has accelerated. At the same time, the storage of geographical data and distribution methods have also changed. Machine-readable open-source data that can be universally produced, re-used, and distributed in GIS started to be used. Transparency, accountability, and aiming at continuous development/enrichment, being

reliable, free, or minimum fee are among the important features of open data (Georgiadis, 2016). Thanks to these advantages, open-source data are gradually increasing their impact on using spatial applications in SE, as in all sectors.

Open data sources (e.g., London Data Store, Open Street Map, ArcGIS Open Data, Esri Living Atlas of the World, and Turkish National Geographic Information System Platform) provide free data services to educational institutions, making it very easy to use and process spatial data. Thus, the difficulty of accessing data, which is the most important problem in creating web applications for learning outcomes in SE, has been eliminated.

1.4. Web and mobile GIS applications

Web and mobile GIS applications are easy-to-use and map-based computer programs that end users access via mobile devices and web browsers. End users directly use these application interfaces. Data and map services used in web GIS become useful through web and mobile GIS applications. Web GIS is also for those without software development skills, since it enables the creation of interesting web and mobile applications. So how do both teachers and students benefit from or will benefit from such applications? When and how do they use web and mobile applications? In geography lessons, teachers mostly prefer to use paper maps to help students upskill ST. However, paper maps are insufficient, and digital maps are needed for students to explore the world starting from their environment and to participate more actively in the lesson. Through these digital maps, students can mark their location and important points around them and establish a spatial relationship between them. These digital maps are the basic components used in web and mobile applications. Therefore, different mobile applications can be used in teaching geography lessons, depending on the lesson's purpose.

Foremost among these are ArcGIS Survey123, ArcGIS Field Maps, and ArcGIS QuickCapture applications belonging to Esri company due to their ease of use and simplicity. For example, for a lesson on environmental pollution, students can enter the location of the objects polluting the environment (garbage, dead animals, factory wastes, etc.) with the ArcGIS Survey123 mobile application, collect detailed information and photograph them. In addition, they can collect the additional information of damaged buildings after natural disasters with the ArcGIS Field Maps application, which can work offline. ArcGIS QuickCapture, on the other hand, is one of the mobile applications that can be used to quickly take photos and locations of trees on the school campus. With all these features, web and mobile GIS applications have become an important tool in developing ST and geographical inquiry skills since they have increased the interest and motivation of students in SE geography lessons. In addition, web and mobile GIS applications promote an interdisciplinary approach to teaching Science, Technology, Engineering, and Math through integration and interoperability with spatial technologies such as GPS and geolocation data, open data, multi-scale data, real-time data, and spatial data infrastructures (de Miguel González & de Lázaro Torres, 2020). In addition, web and mobile applications appear as instructional technology and material and as computer programs that contribute to the project-based learning process.

2. Materials and methods

This study designed a web GIS application to support secondary school students in increasing their ST, geographical inquiry, and perception of change and continuity. This application,

which was prepared for the acquisition of the secondary EGC, was shaped according to the title of Internal Forces in Türkiye within the 10th-grade 1st unit—Natural Systems. When the unit achievements are evaluated, it is expected that the effect of internal forces on the formation of the landforms in Türkiye will be explained within the relevant topic (MEB, 2018). With this approach, it is aimed that students establish a relationship between fault lines, plate boundaries, and earthquakes in Türkiye. Since Türkiye is located on active fault zones regarding its geographical location and geomorphological development processes, significant earthquakes have occurred throughout history. The risks of this danger for Türkiye are also increasing with the great earthquakes. In the instrumental period between April 1903 and March 2023, 37 earthquakes greater than 6.5 Mw occurred in Türkiye (Bogazici University, 2023). Since 1970, there have been seven earthquakes greater than seven magnitudes (Mw). Finally, on February 6, 2023, its instrumental Mw (7.7; Şehitkamil, Gaziantep), which lasted 75 seconds at 4:17 with a focal depth of approximately 5 km and at 13:24, there were two earthquakes with a Mw of 7.6 (Ekinözü, Kahramanmaraş) that lasted 25 seconds. The first major earthquake occurred on the Eastern Anatolian Fault Zone, and the second one occurred on the secondary transition from this fault zone. After these two shallow and severe earthquakes, another earthquake with a focal depth of 8 km and Mw = 6.4 occurred on February 20, 2023, at 20:04 Turkish time. More than 9,000 earthquakes happened in the region between 6 and 27 February 2023. Nearly 13 million people were directly affected by these earthquakes and more than 43,000 people died (Bogazici University, 2023). The first meaningful way to minimize these risks is to increase the essential disaster awareness and the awareness of the society. In this context, secondary school students establish and question the relationship between fault lines and earthquakes and their place within the scope of the geography course. For all these reasons, the fact that the achievements are met in life and that Türkiye is located in active geography regarding natural disasters, it has come to the fore in choosing the relevant subject.

The fault lines used within the scope of the study were obtained by digitizing the active fault maps of the 1:500,000 scaled Mineral Research and Exploration General Directorate (MTA; 2021). Earthquakes greater than five Mw that occurred in Türkiye between 1900 and 2021 were obtained from the earthquake catalog of the Kandilli Observatory and Earthquake Research Institute. Türkiye's border data were obtained from the General Directorate of Mapping 1:1.000.000 scaled Map of Türkiye Civil Administration Departments (Republic of Türkiye Ministry of National Defense General Directorate of Mapping, 2022). Population data were obtained from the TÜİK (2022). In addition, Esri's ArcGIS Online (2022) map services were used as the base map.

The study, which was carried out to set an example for SE geography lessons, consists of three interrelated stages (Figure 1). In the first stage, the data used on the application were prepared with the desktop GIS software ArcGIS for Desktop Advanced 10.8.2 (Esri, 2022). In the second stage of the study, the data were transferred to the Internet as a web detail service (WFS) with ArcGIS for Server Advanced 10.8.2 software so that more than one person can access it at the same time. ArcGIS for Server Advanced 10.8.2 is one of the types of software used to transfer data from personal computers to the internet environment. Thanks to this software, base data to be used in web applications are created, managed, published, and shared. In the last stage of the study, the cloud-based ArcGIS Online product was preferred because it did not require coding skills. At this stage, the web application was designed in all

its aspects and has an up-to-date interface for end-users. Thusly designed application works entirely on the web and is open to use 24/7. Users can access the application via any device with the Internet (computer, phone, tablet, etc.). Again, QR code identification has been carried out to facilitate access to the application.

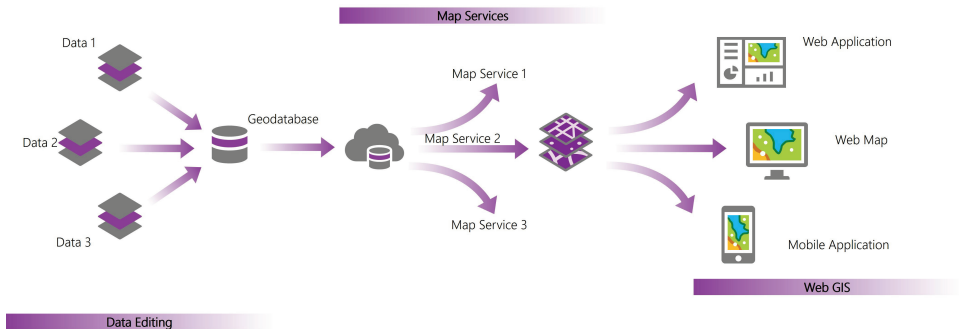


Figure 1. The designed web application workflow chart.

The last stage was carried out entirely with web GIS techniques, and a web application was designed for SE geography course acquisitions. In practice, map services that will not make the users wait too long at the beginning of the web application and that will not tire the user's devices and will not force them, come to the fore (Ocak & Bahadır, 2021). The production of these services is carried out after the data production phase and can be used by users on different platforms after the services are produced (Döker & Ocak, 2020). In other words, the map services produced in the second stage of the study appear as data used in the web application.

3. Results and discussion

Web within the scope of the study, a sample web GIS application, was designed to use web GIS technology as an effective teaching technology and material in SE geography lessons. Thanks to the application Natural systems - Internal Forces in Turkey, which is planned to contribute to teaching classes by concretizing, teachers and students will teach their lessons with interactive applications. At the same time, the comprehension and retention rate of the classes will increase. Accessing the application at any time, from any device with an internet connection is possible. The application designed on the Internet is open for use 24/7 and is easy to access thanks to this feature. Teachers and students can access the application both during and after the lesson.

To be used in the web application designed within the scope of the study, an example topic was selected under the title of Internal Forces in Türkiye in the 10th-grade 1st unit—Natural Systems. Using the web application, a learning scenario was designed for the students to understand the earthquakes in Türkiye and their spatial relations. However, since this designed web application is an exemplary study (to be) used in geography lessons, its technical features are emphasized. The aim is to explain the usability of such web applications in parallel with the course gains.

The designed acquisition application consists of two main parts. The first is the web map used in the web application, and the other is the web application where the achievements are reflected (Figure 2).

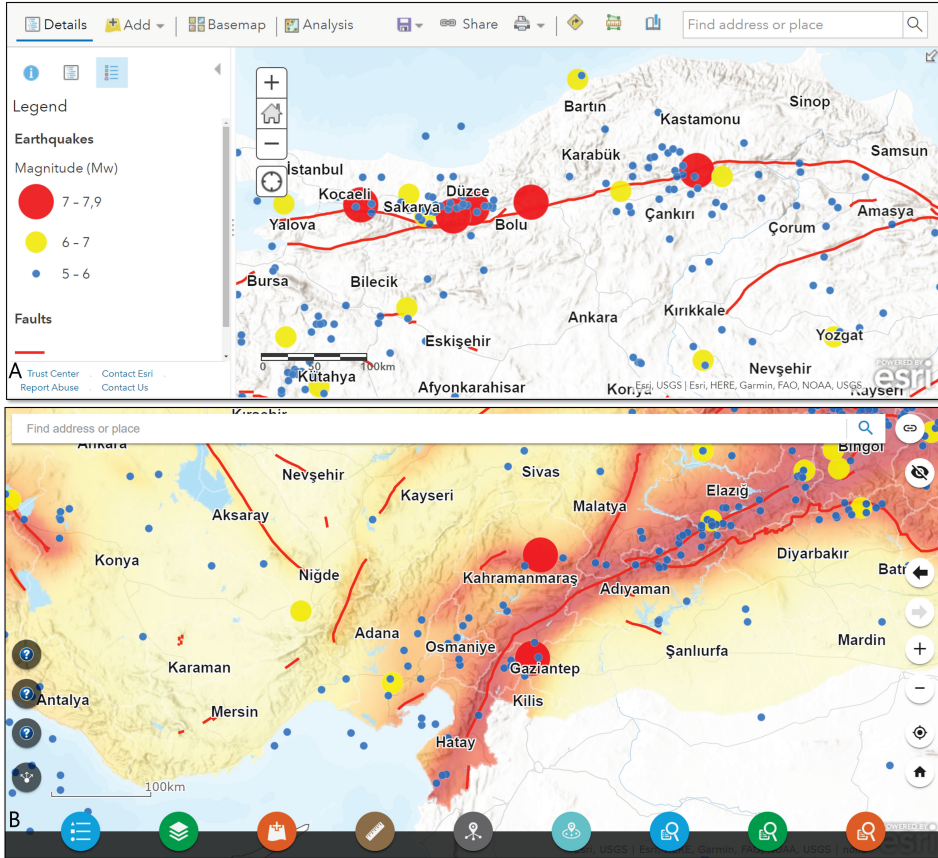


Figure 2. Web map (A) and web application (B).

Web maps are interfaces that were previously created map services (WFS, WMS, WMTS, KML, ArcGIS Rest Services) are used as layers, and various map operations (scale, extent, etc.) and settings related to layers are made (Döker & Ocak, 2020). The data obtained in this study were converted to WFS and added to the relevant web map. The resulting interactive web map was made ready for SE learning outcomes by arranging the symbology settings.

In the second stage of the study, a web application was designed using web layers and web maps containing these layers. Tools such as Add Data, Information Summary, Search Near Me, Hints, and Query have been added to the designed web application to make the application user-friendly (Figure 2B). Thus, the application aims at secondary school students and teachers who use web GIS more effectively in in-class activities aimed at learning outcomes.

With the "Add Data" tool used in the application, it is possible to use open data and services. For example, The Türkiye Earthquake Hazard Map, which the Ministry of Interior

provides, Disaster and Emergency Management Presidency and accessed from the Turkish National Geographic Information System (TUCBS), geographic service pool (Republic of Türkiye Ministry of Environment, Urbanization and Climate Change, 2022) can be added to the application. Thus, secondary school students can see which earthquake danger zone they live in using the application.

Within the scope of the Secondary School 10th Grade unit entitled Natural Systems, there are applications in “The Effect of Internal Forces on the Formation Process of Landforms in Türkiye” to improve students' ST and geographical inquiry skills. Within the scope of the study, these applications were discussed interactively. For example, examining the locations of the fault lines in Türkiye, examining the locations of the earthquakes occurring at the specified distance to the relevant fault lines, and analyzing the spatial distribution of some major earthquakes in Türkiye were provided with the “Query” tools.

Türkiye is located in one of the most active earthquake zones in the world. One of the most important indicators is that more than 1,000 earthquakes greater than five Mw occurred between 1900 and 2021 (Bogazici University, 2023). In addition, there are live fault lines in Türkiye with a length of 24,500 kilometers (MTA, 2021), and 98% of the total population in Türkiye is more or less affected by the earthquake (Şahin, 2019). To establish the spatial relations of this situation by secondary school students, a tool was added to the application in which the relationship between earthquake and population in Türkiye was questioned. The cross-examination method, in which attribute and spatial information are asked for, was also used in the same query. In this way, the students could question and analyze the earthquakes that occurred in Türkiye greater than seven Mw and the settlements with a specific population near the earthquakes that occurred in Türkiye greater than seven Mw on the application. In addition, with the “Search Near Me” tool, students can learn how many earthquakes have occurred at a certain distance from their location and in which historical periods. Apart from these features, tools such as Legend, Layer Management, Find My Location, Search for Address or Place, Default Scale, Overview, full-screen usage, and sharing on various platforms have enriched the application and made it easier to use. The application has two different versions, both Turkish and English. The Turkish version of the application has been prepared for teachers and students in Türkiye. On the other hand, the English version of the application has been prepared with the thought that it can be evaluated in the international literature. In addition, hyperlinks have been established on the landing pages in order to allow applications to switch between each other. The application, which can be accessed for English via <https://arcg.is/0ayz4b0> and for Turkish via <https://arcg.is/D1CXf> web address, has a flexible technological infrastructure that can be used on all web browsers, mobile devices, and smart boards. At the same time, the application can be accessed faster with the QR code produced.

4. Conclusion

This application, designed to be used in SE geography lessons, uses cloud computing and web GIS technologies. Today, web GIS tools have become a critical teaching material for geography teachers and academic and professional GIS users. With Web GIS, the biggest obstacles to using GIS in SE institutions, access to licensed software, high technology literacy, and inadequacy of technological infrastructure in schools, are eliminated. Smart mapping, open-source data, web, and mobile applications are important technological developments

that facilitate the use of GIS by SE institutions. Students can quickly acquire inquiry-based learning and ST skills with well-structured practices.

Within the scope of the study, a sample application was designed to use web GIS tools in geography teaching. This resulting example was prepared using ArcGIS Online, a cloud technology product. ArcGIS Online has been preferred because it has only application development capabilities without software development skills and knowledge. With this feature, ArcGIS Online makes it easy to design applications and enables you to create practical applications for your needs quickly. Again, the fact that it is a product developed entirely on the Internet reduces the costs to a minimum and increases the use rate. Thanks to this designed application, it is straightforward to make inquiries (earthquake query, fault line query, etc.) from verbal and spatial data regarding the achievements in geography lessons. Being an internet-based application and being easy to use will make teachers' work easier and encourage the preparation of course materials with web GIS applications. At the same time, this application has been designed as a user-centered and user-friendly product, considering the needs and goals of teachers and students. The designed sample application is associated with the subject of "The Effect of Internal Forces on the Formation Process of Landforms in Türkiye" in the 10th-grade "Natural Systems" unit of SE geography. It is aimed that students can establish spatial relationships between fault lines and earthquakes in Türkiye, which are located on active fault zones. In this context, "Query Fault Line" to examine the locations of fault lines in Türkiye, "Query Earthquake" to explore the locations of earthquakes occurring near the fault lines and examines the relationship between earthquakes in Türkiye and the population living in these regions, "Query Population" tools have been added to the application. In addition, "Search Near Me" tool, where students can inquire about earthquakes in and around the region they live in, is also included in the application to increase disaster consciousness and awareness. In order to access geographical data from open data sources, the "Add Data" tool and the "Türkiye Earthquake Hazard Map" from the TUCBS portal can be added to the application. The advantages that can be done with this web application can be listed as follows:

- It is possible to access the application from web browsers and smart devices. In this way, it is suitable for the common use of many students simultaneously;
- Students' prior knowledge about the subject can be checked before the lesson, and their pre-post-class situations can be compared;
- Each student can participate in the lesson by drawing, writing, and questioning on the application;
- Thanks to the questions ready on the application, questions can be asked to the students as the lesson is explained;
- Students can find the answers to the questions using the application's answering tools;
- As students search for answers on the application, they can establish the cause-effect relationship between events; and
- The application can also be accessed with the QR code feature.

Within the scope of this study, a solution proposal has been put forward that allows SE geography teachers to use Geographical Information Technologies in the classroom more effectively and beneficially. Undoubtedly, for these goals to be realized and used in schools, applications should be designed for all acquisitions suitable for GIS use within the scope of the secondary EGC. The inclusion of relevant web links and QR codes in the textbooks and

printed materials would be beneficial to provide a faster relationship between all the applications to be designed and the achievements.

In addition, in-service training should be organized so that geography teachers can easily use available applications and design their unique applications. Besides, elective courses are recommended to be compulsory to develop applied web GIS skills in undergraduate programs of prospective teachers. To make the application reach wider audiences later in the studies, it is planned to test the teaching rankings in the application region with the Web GIS events organized in schools. It will also be possible to reveal the strong and weak aspects of the anticipated expectations with the questionnaires to be sent to the teachers and students. In this way, other applications suitable for the web GIS application in the Turkish geography curriculum will be designed to be more beneficial. In this study, it is thought that the sample application created on the ArcGIS Online platform will be developed on a platform that will allow teachers to build their applications as open-source code in the following stages. Additionally, to make the application reach wider audiences in the later stages of the studies, we will focus on testing its contribution to teaching with web GIS activities in schools and revealing its strengths and weaknesses. Designing applications for all acquirements, and continuing the software lifecycle by transferring the designed applications to the open-source platform is also considered.

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