

Geography Teachers' Perspectives towards Geography Education with Geographic Information Systems (GIS)

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Abstract: The purpose of this research is to put forth a total of 104 geography teachers' perspectives towards the use and applications of GIS through a questionnaire throughout Turkey. In the study, general survey model was used and the questionnaire was used as data gathering tool. In the analysis of the data, descriptive statistics along with t test and one way analysis of variance (ANOVA) and Chi-square tests were used. According to the findings of the research In terms of educational institutions' physical facilities, nearly half of the institutions have computer labs and only a few of them (22%) have GIS software. A majority of the research teachers have heard about GIS before but only 32% of them are able to use and 25% of them use it in their geography courses. Among the research teachers' students, only 19% of them use GIS or its applications in their projects or assignments. According to the findings, 27% of the research teachers participated in an educational activity towards GIS and 48% of them stated that they know where to take GIS education. A very significant point is that a majority of the geography teachers stated that they would participate in educational activities related to GIS organized by the National Educational Board. The participant geography teachers' opinions towards GIS had no significant difference according to "gender", "age", or "vocational experience" variables.

Keywords: GIS, Geography Teaching, Teachers' perspectives, Geography education

I. INTRODUCTION

The aim of geography teaching for an individual can be summarized as the understanding of life with all its constituents. The students' learning of the features of our world, human systems for their needs, realizing their limitations and the width of universe, meeting their needs with sustainable sources and living in a happy and prosperous atmosphere can be possible with geography knowledge. The role of geography education is so significant in terms of society and the country. Students have the chance to learn the necessity to live together, providing social solidarity and the reasons why social development is so crucial in a society through geography education. Geography education also gives students the conscious of social, financial and cultural improvement of a country by getting the knowledge of individuals' and societal problems and the skills to find out solutions to the problems. [1].

In order to teach geography well there are some important issues to be discussed. Among these issues, teaching methods and techniques are so significant. Since there is a rapid change in people's social lives they get used to them and look for their reflections in every aspects of their lives including education. People use mobile phones, computers and all other kinds of technologic and electronic devices with advanced technology. These novelties should be reflected to education. So the more technology and contemporary methods and techniques in the lessons may mean more success in the lessons. The other aspect to be discussed in teaching geography is the teachers' perspectives towards the teaching methods, techniques or teaching materials. Teachers are the directors of the lesson so if they like and adopt something they may apply it in an appropriate way. This study aims to put forth teachers' perspectives on using GIS in geography education.

Providing geography teaching in accordance with the expectations in the society will be possible with reflecting the most recent methods, audio visual aids and technology to the lessons. So geography teachers should be in a good level in geography science and have the skills to teach these skills with suitable methods and techniques using the necessary

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materials and technologies in their lessons. Geography teachers being sufficient in their fields depend on their ability to use their knowledge and skills in their lives and their being vocationally good, necessitates their following the recent developments in geography science. In geography teachers' transferring the necessary knowledge and skills to the students in a suitable way they should choose the right methods and techniques.

Recently, there have been used new methods and techniques in geography teaching as well as the other educational fields. Consequently, New Technologies are embedded in this process. The use of computer and some programs in relation with the lessons, projectors, videos, interactive boards, digital and electronic devices are some of them. Geographic Information Systems (GIS) is one of these programs which are currently being used in the teaching of geography. There are so many studies towards the benefits and positive dimensions of these novelties in the teaching of geography.

Geographic information systems (GIS) is one of the current popular teaching aid in teaching geography. GIS provide a technology and method to analyze spatial data, or information about the Earth. The earth's climate, natural hazards, population, geology, vegetation, soils, land use, and other characteristics can be analyzed in a GIS using computerized maps, aerial photographs, satellite images, databases, and graphs. Since the 1960s, GIS has quietly transformed decision-making in universities, government, and industry by bringing digital spatial data sets and geographic analysis to desktop computers [2].

Many studies concerning GIS reveal that it is an effective tool to promote students' geographic skills including helping students to think geographically, analyze and make inferences on spatial data, as well as provide student and teacher motivation, and adopting project based teaching and learning [3.4.5.6.7.2.8].

In geography lessons the usage of GIS gives the students the opportunity to learn better and being able to improve social, mental and technical skills. Students learn the geographical themes using GIS; they load the necessary data to the computer and make relevant analysis. This kind of learning is based on doing, experiencing and being involved in the activities but not memorizing. Second and the most important function of GIS is assisting students in developing multi dimensional skills in relation with their lessons. A student using GIS can improve several skills through the study. As Demirci [9] states, some of the skills that can be improved through GIS are data gathering, data production, making a research, using data gathering tools, developing data gathering methods, working both individually and in group, verification of the data, using computer and technology, loading the data into computer, developing statistical computation skill, making observations, turning the observations into data establishing relations between data, comparing, finding the similarities and differences, making analysis, producing new data using the present data, critical thinking, developing analysis methods, improving alternative methods, finding out trustable and short ways in solving the problems, turning the data into maps, graphs and tables, commenting on maps, graphs and tables, being able to do spatial analysis, cause-result analysis, evaluating the results. GIS is being used in geography, environmental sciences, forestry, land use, regional planning, security, health and agriculture and some other fields commonly. At university level GIS is being used as a tool in more than 100 academic fields [10].

GIS lessons are being used in most of the developed countries as the USA, Canada and the European countries currently. The contribution of GIS to undergraduate programs at universities had strong influences on the secondary education schools in the USA and some other developed countries [11]. Because of such advantages in the USA, Canada and England at first and then Denmark, Germany, France, Finland, Sweden and Holland began to use GIS in geography and together with sciences, chemistry, biology, math, environmental sciences and social sciences as well in their secondary education schools [12-16]. Students' using GIS in classroom atmosphere actively will provide them with different analysis and synthesis in geographic knowledge in accordance with constructivist teaching approach. Students' being active in the classroom will have positive influence over learning skills [17].

II. METHOD

A. Purpose of The Study

The purpose of this research is to put forth the teachers' perspectives towards GIS applications with the participants from different parts of Turkey. To reach the given purpose a wide range of teachers both from state schools and private

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sectors (private schools, preparatory courses etc.) were cooperated with. In order to determine the teachers' perspectives, their level of knowledge on GIS applications is also important. So, the participant teachers' level of knowledge on GIS program was taken into consideration in the survey questionnaire.

B. Research Model

The model used in this research was survey. Survey model is based on describing a present or past situation as it is actual conditions. The particular research event, individual or object is described in its own conditions in the research [18].

C. Research Group

The research was conducted over 104 geography teachers from different parts of Turkey through email. The distribution of the research, teachers according to gender is given in table 1.

TABLE 1
DISTRIBUTION OF GEOGRAPHY TEACHERS ACCORDING TO GENDER IN THE RESEARCH

Gender	Frequency (f)	Percentage (%)
Male	64	61.5
Female	40	38.4
Total	104	100.0

According to table 1, 104 teachers (64 males, 40 females) participated in the research.

D. Data Gathering Phase

A survey developed by Demirci [9] was used as data gathering tool. The survey included personal questions, school types (private or state school), vocational experience, educational background and questions related to GIS (their familiarity of GIS, use of GIS in the courses, devices and software for GIS) and in the last part their opinions towards the efficiency of GIS in geography courses. The reliability study of the survey used in the research was also carried out.

E. Data Analysis

The data of the research was evaluated with "SPSS 17.0" program. To analyze the geography teachers' answers to the survey questions, frequency, percentage and arithmetic average values were used. In order to determine whether the geography teachers' opinions towards geography education with GIS applications according to "gender", "age" and "vocational experience" variable is meaningful or not, *t test*, "one way analysis of variance (ANOVA)" and *Chi-square* tests were applied.

III. FINDINGS

A. Findings related to personal information of geography teachers and their vocational experience

Findings about geography teachers' personal information and vocational experience were given in table 2.

TABLE 2
PERSONAL INFORMATION AND VOCATIONAL EXPERIENCE OF RESEARCH GEOGRAPHY TEACHERS

		f (n=104)	%
Gender	Male	64	61.5
	Female	40	38.5
Age	26-32	41	39.4
	33-40	49	47.1
	41 and over	14	13.5
Current school	State school	29	27.9
	Private school	51	49.0
	Preparatory Courses	24	23.1

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Vocational experience	1-4 years	7	6.7
	5-9 years	31	29.8
	10-14 years	36	34.6
	15 years or more	30	28.8
Last graduation degree	University	69	66.3
	Master's degree	30	28.8
	Doctorate degree	5	4.8

According to table 2, 64 of the geography teachers in the research are males, 40 participants are females. There are 41 teachers in the 26-32 age group, 49 teachers are at 33-40 age group and 14 of them are 41 years and over. 29 teachers are state school teachers, 51 teachers are at private schools and 24 of them are at preparatory courses. 7 geography teachers have 1-4 years of vocational experience, 31 of them have 5-9 years of experience, 36 of them have 10-14 years of experience and 30 geography teachers have 15 years of experience or over. Among the participants 30 teachers have master's degree and 5 teachers have doctorate degree.

B. Findings About Teachers' Opinions Towards The Availability of Using GIS in Their Schools

Table 3 indicates participant teachers' opinions about the availability of GIS in the geography courses in their schools.

TABLE 3
CHI SQUARE TEST INDICATING GEOGRAPHY TEACHERS' REPLIES ABOUT THE AVAILABILITY OF USING GIS IN THE SURVEY THAT WERE GIVEN BY THE GEOGRAPHY TEACHERS IN THE RESEARCH

Expressions about GIS and its Usage in the Courses	Age groups of the Participants							
	26 – 32 N=41	33 – 40 N=49	41+ N=14	Total				
	S	S	S	S	%	X ²	P	
Do you have a Computer lab in your school that can be used in geography courses?	17	24	8	49	47	1.159	2	.560
Do you have a GIS software?	8	9	6	23	22	4.058	2	.131
Does your school have a GIS software?	7	7	3	17	16	0.432	2	.806
I have heard the GIS term for the first time	7	6	2	15	14	0.422	2	.810
I know about GIS and its applications	26	31	10	67	64	0.347	2	.841
I know using a GIS program	13	14	6	33	32	1.026	2	.599
I have necessary documents (data, map, photo, etc.) to prepare an activity based on GIS	12	12	4	28	27	0.281	2	.869
I can arrange an activity based on GIS.	16	11	7	34	33	4.989	2	.083
I use GIS in my courses	12	10	4	26	25	1.045	2	.593
My students use GIS in their assignments and projects.	9	7	4	20	19	1.753	2	.416
I know where to take GIS education.	23	17	10	50	48	7.630	2	.022
I have participated in vocational seminars, courses, panels, conferences, workshops, etc. Related to GIS before.	14	8	6	28	27	5.690	2	.058
I would like to participate in a vocational educational course related to GIS organized by the National Educational Board.	27	10	10	74	71	1.015	2	.602

As seen in Table 3, 47 % of the geography teachers in the research stated that they have a computer laboratory to use in geography classes, only 22 % of the geography teachers stated that they have a GIS software individually and 16 % of them have GIS software at their schools or institutions. Only 14 % of them stated that they have heard about GIS term for the first time. 64 % of the geography teachers stated that they know about GIS and its applications. Among the geography teachers 32 % of them know using GIS. 27% stated that they have necessary documents to prepare an activity based on GIS and a similar proportion of teachers (33 %) stated that they can arrange activities based on GIS. 25 % of the geography teachers stated that they use GIS in their lessons. 19 % of the research teachers stated that their

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students use GIS in their projects and assignments. Among the geography teachers 48 % of them know where to take a GIS education. 27 % of them stated that they joined vocational seminars, courses, panels, conferences, workshops, etc. related to GIS before. A majority of the geography teachers stated that they would participate in educational courses related to GIS organized by the National Educational Board.

C. Findings about geography teachers' opinions towards GIS applications

The data related to geography teachers' thoughts towards GIS applications was given in Table 4 below.

TABLE 4
ANALYSIS OF GEOGRAPHY TEACHERS' OPINIONS TOWARDS GIS APPLICATIONS

No	Expressions	\bar{X}
1	GIS is an important tool for geography courses.	4.72
2	A geography course without GIS is not complete.	4.56
3	I do not have sufficient time to learn using and to teach GIS program to students.	4.46
4	Teachers' background and schools' facilities are not enough to use GIS in geography courses.	4.72
5	Ministry of National Education does not provide sufficient support about the use of GIS in geography courses	4.62

According to table 4, arithmetic average of geography teachers' opinions towards the GIS education is found as 4.62. Based on this, a majority of the research geography teachers stated that they agree with the expressions in the survey. The items with the highest percentage in the survey was "GIS is an important tool for geography courses" and "Teachers' background and schools' facilities are not enough to use GIS in geography courses." ($\bar{X} = 4.72$) and the item with the lowest percentage was "I do not have sufficient time to learn using and to teach GIS program to students" ($\bar{X} = 4.46$).

D. The comparison of geography teachers' views towards GIS according to "gender" variable.

Whether there is a meaningful difference in geography teachers' views towards GIS according to "gender" variable was determined by "independent samples t test" and the results of the analysis were given in table 5.

TABLE 5
T TEST RESULTS COMPARING GEOGRAPHY TEACHERS' VIEWS TOWARDS GIS ACCORDING TO "GENDER" VARIABLE

	N	X	Ss	Sd	t	P
Female	40	17.35	3.68	102	1.159	.249
Male	64	18.19	3.52			

As seen in table 5, there has been no meaningful difference in geography teachers' views towards GIS according to "gender" variable ($t_{(102)} = .249; p > 0.05$).

E. The comparison of geography teachers' opinions towards GIS according to "age" variable.

Whether there is a meaningful difference in geography teachers' views towards GIS according to "age" variable was determined by "one way variance analysis (ANOVA)" and the results of the analysis were given in table 6. According to the "one way variance analysis (ANOVA)" results there has not been a meaningful difference statistically in geography teachers' opinions towards GIS according to "age" and "vocational experience" variables [$F(2,101) = .391; p > 0.05$], [$F(3,100) = .585; p > 0.05$].

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TABLE 6:
THE ANOVA RESULTS OF THE COMPARISON OF GEOGRAPHY TEACHERS’ OPINIONS TOWARDS GIS ACCORDING TO “AGE AND VOCATIONAL EXPERIENCE” VARIABLES.

Participants’ opinions towards GIS		Sum of Square	df	Mean squares	F	P
Age	Intergroups	10.197	2	5.099	.391	.678
	In-group	1317.918	101	13.049		
	Total	1328.115	103			
Vocational Experience	Intergroups	22.911	3	7.637	.585	.626
	In-group	1305.205	100	13.052		
	Total	1328.115	103			

IV. CONCLUSION

In this research around a hundred geography teachers’ opinions towards GIS from state schools, private schools and preparatory courses from different cities of Turkey were analyzed. According to the findings of the research the following results can be concluded:

In terms of research teachers’ schools’ or other educational institutions’ physical facilities, nearly half of the institutions have computer labs and only a few of them (22 %) have GIS software. It is clear that a majority of the research teachers have heard about GIS before but only 32 % of them are able to use and 25 % of them use it in their geography courses. Among the research teachers’ students only 19 % of them use GIS or its applications in their projects or assignments. According to the findings, 27 % of the research teachers participated in an educational activity (vocational seminars, courses, panels, conferences, workshops, etc.) towards GIS and 48% of them stated that they know where to take GIS education. A very significant point is that a majority of the geography teachers stated that they would participate in educational activities related to GIS organized by the National Educational Board. It can be said that research teachers know the importance of GIS in geography education but they do not have sufficient physical facilities or they need educational activities to learn and apply GIS.

There was not a significant difference in geography teachers’ views towards GIS according to “gender”, “age” and “vocational experience variables according to research results.

A similar study was carried out by Aydın and Kaya [1] over 108 participants in an applied GIS seminar. They considered similar points and they focused on the need of teachers’ education towards GIS and again they expressed the lack of physical facilities to use GIS and its applications in geography education. In their studies they also stated that the research teachers have positive views on GIS and they believe the efficiency of GIS in teaching geography. In the study it was also emphasized that, there was not a significant difference according to gender, age and vocational experience variables.

Another study was carried out by Artvinli [19] he stated the opinions of teachers towards GIS. He could not find significant difference according to age variable but as he stated, there was meaningful differences in terms of, class sizes, GIS application experiences, school types and their graduation levels. Based on the results of the study there has not been a standard GIS education for geography teachers and they should be given this education by either Ministry of National Education or Universities.

In his study “Evaluating the Implementation and Effectiveness of GIS-Based Application in Secondary School Geography Lessons”, Demirci [20] stated that the teachers were given GIS software, digital data for an application, and the necessary written documents describing the application. Due to various obstacles, only two teachers at two schools out of 14 implemented the application successfully. The study revealed that the use of GIS increased the students’ success on geography lessons by 38% at the first school and by 51% at the second one. The success rate of the students in this study substantiates the need for GIS to be better incorporated into the Geography curriculum in the secondary school level in developing countries.

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As the other studies suggest, It can be concluded that geography teachers have positive opinions towards use of GIS in geography lessons. At this point, the schools' physical facilities should be suitable to use computer technology and GIS applications.

Teachers' training on GIS is also a significant point. Teachers should be actively included in educational activities (seminars, vocational courses, conferences, projects, symposiums, workshops, etc.) about GIS.

Geography teachers' positive thoughts towards technology aided and student centered teaching methods and their willingness towards applications of these are so significant. At this point, geography teachers' views and thoughts should be obtained. This study was carried out in accordance with this idea. All the scientific studies (articles, reports, seminars, workshops, project applications, etc.) towards the use of technology and GIS in the lessons are so crucial in the commonly use of GIS and technologies in Turkey. Also as Artvinli [19] and Aydın & Kaya [1] stated Ministry of National Education (MEB) or Universities should give sufficient education to the teachers or teacher candidates.

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