

COĞRAFİ BİLGİ SİSTEMLERİ DESTEKLİ EĞİTİMİN COĞRAFYA DERSİNDEKİ AKADEMİK BAŞARI ÜZERİNDEKİ ETKİSİ

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ÖZET

Bu araştırmada, ortaöğretim dokuzuncu sınıf Coğrafya dersinde yer alan “Türkiye’nin İklimi” ünitesinde yer alan konuların öğretiminde Coğrafi Bilgi Sistemleri ile coğrafya öğretiminin öğrencilerin akademik başarılarına etkisi incelenmiştir. Çalışmaya, 2009-2010 öğretim yılının ikinci yarısında, Ankara İli Çankaya İlçesi Tapu Kadastro Meslek Lisesi’nde öğrenim gören 9. sınıf öğrencilerinden toplam 45 öğrenci katılmıştır. Araştırmada kontrol gruplu öntest-sontest deneysel araştırma modeli uygulanmıştır. Kontrol grubunda geleneksel öğretim yöntemi, deney grubunda ise Coğrafi Bilgi Sistemleri kullanılarak ders işlenmiştir. Veri toplama aracı olarak “Başarı Testi” öntest- sontest olarak uygulanmıştır. Elde edilen bulgular, SPSS istatistik programı kullanılarak analiz edilmiştir. Testlerden elde edilen sonuçlar, gruplar arasında “ilişkisiz örneklem t-testi”, grup içinde ise “ilişkili örneklem t-testi” kullanılarak 0,05 manidarlık düzeyinde test edilmiştir. Çalışmanın sonucunda coğrafi bilgi sistemleri ile öğretimin uygulandığı deney grubu öğrencileri ile öğretmen merkezli öğretimin uygulandığı kontrol grubu öğrencilerinin akademik başarıları deney grubu lehine anlamlı düzeyde farklılık ortaya çıkmıştır. Yapılan bu çalışma, coğrafya derslerinde CBS kullanımının, öğretimin zenginleştirilmesi, daha etkili ve anlaşılır bir sınıf içi coğrafya öğretiminin gerçekleştirilmesi ve öğrencilerde daha kalıcı bir öğrenmenin sağlanması bakımından önemli olduğunu göstermektedir. CBS’nin etkinlik odaklı öğrenmeyi desteklemesi ve uygulamaya dönük olması, coğrafya öğretimini daha kolay ve etkili hale getirdiği gibi, öğrencilerin öğrenme motivasyonlarını da olumlu yönde etkileyebilmektedir. CBS ile öğrencilerin öğrenme sürecinde aktif rol oynamaları, uygulama sonucunda ürün ortaya koymaları öğrenmelerinin daha kalıcı olmasını sağlamıştır.

Anahtar Kelimeler: Coğrafi Bilgi Sistemleri, Coğrafya Öğretimi, Akademik Başarı

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THE EFFECTS OF GEOGRAPHY INFORMATION SYSTEMS SUPPORTED TRAINING ON THE ACADEMIC SUCCESS IN GEOGRAPHY COURSE

ABSTRACT

In this study the effects of geography teaching through Geography Information Systems, which was used in the “Climate of Turkey” unit issues of the 9th grades in the Geography lesson, on the academic success of the students was researched. The research group of the study were 45 vocational high school students in the center of Ankara in 2009-2010 academic year. Pretest-posttest experimental research model with control group was applied in this research. The lesson was taught through a traditional teaching method for control group while Geographical Information Systems was used for the test group. As data collection tool, achievement test was applied as pretest-posttest. The data obtained were analyzed by using SPSS (Statistical Packet for the Social Science) statistical program. Results taken from tests by using “unrelated samples t- test” between groups and “related samples t- test in groups” were tested in 0.05 significance level. As a result of the findings it was noticed that there was a meaningful difference in favor of test group between the academic success of test group students who were taught through Geographical Information Systems and the control group students who were taught in a teacher centered way. It was noticed that the students were more eager in the lessons carried out with GIS based activities. Students’ being active in the lessons, the lessons’ being done in practice far away from memorizing, and the lessons’ being funny and enjoyable were effective in the increase of test group students’ success. The subjects were demonstrated by making the abstract subjects concrete which made a positive effect on students’ better learning of the subjects. By the help of GIS the students were provided with an active role in their learning process and putting forth a product as a result of the application made their learning more permanent.

Key words: Geographical Information Systems, Geography Teaching, Academic Success

INTRODUCTION

In our age in which the information flow develops and changes very quickly with the technological improvement it is very important for people to be aware of the produced knowledge immediately and to benefit from it at a high level in order not to be fossilized. It is possible to be modernized in the information age only through the education. Education should keep up with the developing and changing technology to implement this

function completely. The role of education in the formation and development of social structure is accepted. So, for a society to develop the curriculums in accordance with the scientific and technological improvements should be developed by making great strides in education.

Computer technology has become one of the most important educational materials for the students to access the information in their researches. Teachers should make use of the technological improvements to able to emphasize the scientific city in the educational environment, to able to apply constructive approach (Ozgen & Cakicioglu, 2008). Geography Information Systems (GIS) is one of the innovations and the most quickly improved technologies regarding to information technologies. According to Heywood (1998) GIS is a system collecting the geographical data on earth, storing, checking, bringing together, using for a specific purpose, analyzing and demonstrating them.

The fields of science and profession groups whose fields of study more or less include location, human, time and the variables related to them have the opportunity to use GIS. Since different fields of science and profession groups have developed their own programs adequate to their needs there are many GIS programs using GIS (Turoglu, 2000).

Today, it is not possible to address any technology which is used more effectively than GIS. Initially GIS helps to geographers to understand the earth more easily by allowing collecting the characteristics of a location in a unique data base, mapping of each characteristics in a numerical media, updating of data needed, getting the map prints in very different formats and scales more easily and quickly. For this reason, it is noticed that the studies made by the geographers when they first meet to GIS are more based on displaying and identifying the characteristics of earth through GIS technologies (Demirci & Karaburun, 2010).

GIS basically including maps in various scales enables benefitting from the map supported applications and analyzing in the best possible way. The information on the map can be demonstrated graphically. GIS has come out through by analyzing information which can explain graphical location based and non-graphical characteristics in the same system in a whole. As it provides a quick and secure access to the obtained information the efficiency and the security of the system will be much more.

The geography curriculum which was radically changed in 2005 has been designed for the students to gain a *geographical conscious* about their country and the whole world beginning from where they live. Constructive approach based curriculum has a student centered and spiral structure. In geography teaching curriculum there are general abilities like critical

thinking ability, creative thinking ability, communication and empathy ability, problem solving ability, decision making ability, *using the information technologies ability*, using Turkish language correctly, nicely and effectively ability, entrepreneurship ability, besides there are *map abilities belong to Geography course*, observation ability, working on the field ability, geographical searching ability, preparing chart, graphic and diagram and interpreting ability, time perception ability, perceiving the change and continuity ability and proof using ability (NME, 2005).

In new geography teaching curriculum it is noticed that current information-communication technologies are supported in geography teaching and the application of GIS (Geography Information Systems) is possible proposed in some gains.

Table1.

GIF applications proposed in new geography teaching curriculum
(Demirci, 2006)

Order	Grade	Numbers of gains proposed	Subjects of proposed activities
1	9	A.9.3	Maps
2		A.9.4	Coordinate system
3		A.9.5-A9.6	Contour lines
4		C.9.5-C.9.6	Climate of Turkey
5		C.9.7	Climate units in Turkey
6	10	A.10.2-A.10.3	Springs of hot water
7		B.10.2	World population
8		B.10.3	Change of population
9		B.10.4	Population dynamics
10		B.10.5	Population pyramids
11		B.10.9-B.10.10	The classification of economical activities
12		C.10.10	Urban structure of Turkey
13		C.10.11	Difference in Turkey's population distribution
14		C.10.12	Population dynamics
15	11	B.11.4-B.11.5-B.11.6	From production to consumption
16		D.11.2	Expansion areas of Turkish culture
17	12	C.12.4-C.12.5.	Commercial structure of Turkey
18		C.12.8-C.12.9	Future scenarios in Turkey's population
19		D.12.6	Location of coteries
20		D.12.8	Regionalization of the world

The usage of GIS in Geography lessons has primarily two functions. The first one is the comprehension of the subject thought by the students. The student learns the subject that was taught through GIS by entering the data related to the subject, processing and analyzing it. The second and the most important one is that it helps the students to develop multi dimensional skills. GIS as an active data processing tool enables to be used in almost every field of geography effectively (Demirci, 2004).

Bowman et. al. (2005) states the benefits of the GIS application in lessons as in the following:

1) Students apply for the critical thinking abilities in order to organize and use the information obtained from various resources.

 } They use historical, geographical and statistical data to answer the geographical questions and make an inference based on the relations among the geographical cases.

 } They evaluate and analyze the validity and the utility of the primary and secondary resources like air photographs and the maps.

 } They interpret the maps to answer the geographical questions, to make an inference based on the relationships among the geographical cases and to analyze the geographical changes.

 } They use the basic statistical concepts and analytical methods to analyze the geographical data.

 } By using the maps obtained from GIS they analyze the needed data to solve the geographical and residential problems.

2) The students communicate in written, verbal and visual ways.

 } They arrange and draw maps, diagrams, tables and graphics to present the geographical information including geographical characteristics, geographical distributions and geographical relations.

 } They apply the appropriate words, generalizations and theories to present the geographic information.

3) By using the decision making and problem solving abilities the students study in dependently or they do group work.

 } They plan, arrange and complete the geographical questions, analyzed and arranged geographical information and the group research projects.

 } They use GIS to answer the global problems, to detect the geographical problems and to have the geographical information and abilities.

} By using the problem solving process they detect the problem, collect the information, list the options and consider the advantages and disadvantages. They choose the solution, apply it and then evaluate the effectiveness of the solutions.

} They use the decision making process to collect the information, to determine the options, to guess the results and to define a situation in which the decision is applied.

Aim of the Study

Some researches displaying the effectiveness of GIS in geography teaching take place in the related literature (Cameron, 2005; Oner, 2011; Demirci, 2006; Tiyekli, 2007; Simsek, 2007; Balciogullari, 2011; Yurdam, 2013). Having been applied in a vocational school is the difference of this study from the others. Geography is one of the courses instructed in vocational high schools together with some other lessons in a category called as “cultural courses” in Turkey. According to the studies (Ersoy, 2007; Gul, 2008; Karadag, 2009) students pay less attention to the cultural courses than the vocational courses in vocational high schools, so their interest to the course and to be successful is low. In order to reach the defined acquisitions in cultural courses like geography course, student centered teaching methods supported with teaching technologies like GIS are to be used. The aim of this study is to expose the effect of teaching the issues of “A residential synthesis: Turkey” learning scope in the 9th grade geography course program through GIS applications on the success level of the vocational high school students.

For this purpose, the knowledge level of both the test and control group students about “A residential synthesis: Turkey” learning scope were determined. Then, the students of the test group were exposed to GIS while lecturing method was used for the control group students as the teaching method. The problem of the study is that: *Is there a meaningful difference between the success level of the test group students who have been thought the issues of “A residential synthesis: Turkey” learning scope in the 9th grades curriculum through GIS applications and the control group students who have been taught through traditional lecturing method?*

METHOD

Research Model

This study is based on an experimental model. The experimental model is a research model in which the data wanted to be observed is produced under the control of the researcher aiming to detect the reason-

result relationship. In this model the observation data is produced by the researcher. The aims are stated in the form of hypotheses. So, it is a step on the way of developing theories by testing the judgments about the possible causes of the events (Karasar, 1998:87).

This is an experimental design model study including pre-test/post-test control group. Design with pre-test/post-test control group is a widely used model in the social sciences. The participants are measured before and after the testing process with regard to the dependant variable. Since participants are evaluated before and after the testing process with regards to the dependant variable this design is a related design. Also, because of the comparison the measurements of the test and control group it is an related design (Buyukozturk, 2001:21).In this type of study it should be considered that the pre-test, post-test scores of the test and control group should be near to each others as much as possible (Kaptan, 1998:85).

In the study randomly chosen test and control groups are both applied pre-test/ post-test. By means of pre-test the students were controlled whether they had pre information about the issue. Post-test was applied after teaching the issues to the test and the control groups through different methods. The effectiveness of the experimental study has been measured through the differentiation of the groups by analyzing the post-test scores. Academic success is the dependent variable whereas GIS supported learning is the independent variable of the study.

Study Group

The study group was composed of the 9th grade students attending to Vocational High School (educating on land registry and cadastre) in Çankaya city of Ankara province during 2009-2010 education year. The students in the test and the control group were also chosen randomly. Distribution of the students in test and the control groups according to gender takes place in the Table 2.

Table 2.
Gender distributions of the students:

Group	Male	Female	Total
Test Group	17	5	22
Control Group	16	7	23
Total	33	12	45

In examining the gender distributions of the students it is noticed that the number of the male students are more than the females both in the test and the control group. It is because the total number of the male students is more than the female students in school normally.

Data Collecting Instrument

Success Test: In the study the questions have been chosen among the questions placed in the university entrance exams (OSS and OYS) in Turkey before, which are parallel with the constructive approach and appropriate for the cognitive, affective and psychomotor growing of students considering the 9th grade acquisitions about the “Climate of Turkey” issues of “A residential synthesis: Turkey” learning scope. This test consists of 25 five- option questions including a true option and four distracters. Since the questions used in the prepared test were obtained from the university entrance examinations in Turkey organized by OSYM (a Turkish public institution which was founded for selecting and placing the students through examinations) a reliability analysis was not needed since it was done by OSYM before. The success test was applied twice as before and after the practice in the form of in pre-test/post-test. During the pre-test the students were not told about the post-test, so any attempt to take note of the questions was prevented. Post-test was applied to compare the effects of teaching the “Climate of Turkey” issues through two different methods on the students’ academic success.

The Study Steps

During the test practicing process the following steps were applied in the study:

1. A written permission was taken from the relevant authorities. The school director and the geography teacher were informed about the research before. The teacher of the classroom in the survey was informed about the GIS, the date of the survey and the application program was decided.
2. The acquisitions of the “Climate of Turkey” issues were determined. In the study the materials about it of “Climate of Turkey” were prepared. In the preparation ArcView 9.2 program was used among the GIS programs.
3. Test and control group were chosen randomly.
4. In the study a success test composed of 25 questions which had been tested for the validity and reliability before and an attitude

scale including 39 items for the Geography course was applied as a pre-test to the test and the control groups to measure.

5. The test group students were informed about GIS before the application. They were enabled to get the necessary basic skills to use the GIS program.
6. An instruction application form to help the test group students were prepared and distributed to the students.
7. In the research scope the test group was applied to GIS whereas teacher centered methods (lecturing, question and answer) were applied to the control group during the process.
8. Success test was applied to the test and control groups as the post-test.
9. The data obtained were analyzed.

Data Analysis and Interpretation

Pre-test/post-test control group design which can be also defined as a split-plot or mixed design is a two-factor design one of which denotes the repetitive scaling (pre-test/post-test) and the other one denotes the experimental subjects placed in the different categories. A test subject can only take part whether in a test group or control group. From the four experimental conditions coming with a 2x2 design just two are measured with the dependant variables whereas other two are not measured in. In the analysis of the data obtained from such a design two-factor ANOVA can be used for the repetitive measuring on a single factor to measure the effects of the test process (Buyukozturk, 2001:37).

The data obtained from the analysis were collected in two stages in the research, pre-test and post-test were applied to test and control groups. In order to understand whether there is a meaningful difference between the pre-test/post-test score achievements of the students in the test and the control group “related samples t-test” analysis was applied. On the other hand to understand whether the difference between the pre-test/post-test score difference of the test group and the difference between the pre-test/post-test score difference of the control group is statistically meaningful “related samples t-test” was applied. The other statistical procedures used in the data analysis are arithmetic mean (\bar{X}), standard deviation (s), frequencies (f), and percentage (%). Statistical procedures were applied by means of SPSS 15 packet program. Whether the obtained data is meaningful or not was tested in 0.05 level.

FINDINGS

Findings about the Success Levels of the Students in the Test and the Control Group

The success levels of the students in the test and the control group were analyzed before and after the application.

Comparing Pre-test Scores of the Students in the Test and the Control Group:

The pre-test results belonging to "Climate of Turkey" unit in the 9th grade Geography course related to whether *there is a meaningful difference between the test and the control group students* are presented in the Table 3.

Table 3.

T-Test Results of the Independent Groups Related to Comparing Pre-test Scores of the Test and the Control Group Students

	Groups	n	X	SS	Sd	t	p
Pretest	Control Group	23	8,82	2,260	43	-,610	,545
	Test Group	22	8,39	2,426			

If analyzed the results emerged by applying t-test to the numbers of the correct answers obtained in the success test in the independent groups, the correct answer means of the test group students is 8,39 whereas the control group students is 8,82. This finding denotes that there is not a meaningful difference between the knowledge levels of the test and the control group students about "Climate of Turkey" issue.

Comparing the Pre-test/Post-test Scores of the Control Group Students:

T-test results about whether the academic achievement scores of the control group students before and after the test has a meaningful difference in the group they belong to is illustrated in the Table 4.

Table 4.

T-test Results of the Dependent Groups Related to Comparing The Pre-test/Post-test Scores of the Control Group Students

Measurement	n	X	SS	Sd	t	p
Pre-test	23	8,82	2,26	22	16,33	.00
Post-test	23	16,91	3,07			

In the result of the training in which the control group students were taught in a traditional teaching method, the findings obtained from testing the success scores of the pre-test and post-test by t-test in dependant groups which is used for related sample groups were analyzed. Regarding this analysis the pre-test success score means of the control group students is $\bar{X} = 8,82$ while the post-test success score means is $\bar{X} = 16,91$. It is found out that $t = 16,33$ and $p < 0.05$ in t-test analysis which was done to understand whether there is a meaningful difference between the two means.

Comparing the Pre-test/ Post-test Scores of the Students in the Test Group

It was searched for whether there was meaningful difference between the pre-test/post-test scores of the test group students who were taught through GIS supported training. For this purpose “related samples t-test” was used to test the difference between the means. The results of the test can be seen in the Table 5.

Tablo 5.

T-test Results of the Test Group Students Related to Comparing the Pre-test/ Post-test Scores

Measurement	n	\bar{X}	SS	Sd	t	df	p
Pre-test	22	8,39	2,42	,506	23,45	21	.00
Post-test	22	20,05	2.52	,536			

The findings prevailed by depended group t-test used for the “**related sampling groups**” in analyzing the pre-test/post-test success scores of the test group students who were exposed to GIS supported training were analyzed. According to these findings, the post-test success score means of the test group increased to $\bar{X} = 20,05$, whereas the pre-test success score means was $\bar{X} = 8,39$. When tested by t-test analysis to understand whether there is a meaningful difference between the obtained means it was found out that $t = 23,45$ and $p < 0.05$. So, it is deduced that there is a meaningful difference between the pre-test/post-test success scores of the test group. It is indicative of the effectiveness of the GIS supported teaching method in geography teaching.

Comparing the Post-test Scores of the Test and the Control Group Students

The findings about whether there is a meaningful difference between the post-test scores of the test and control group students are given place in the Table 6.

Table 6.

T-test in the Independent Groups Results Related to Comparing the Post-test Results of the Test and the Control Group Students

	Groups	<i>n</i>	\bar{X}	<i>SS</i>	<i>Sd</i>	<i>t</i>	<i>df</i>	<i>p</i>
Post-test	Control Group	23	16,91	3,074	,641	-	43	,015
	Test Group	22	20,05	2,526	0,536	2,540		

As seen in the Table 6, while the post-test scores of the test group students is $\bar{X}=20,05$, the post-test result of the test group is $\bar{X}=16,91$. It indicates that the success levels of both the test and the control group are differentiating from each others at the post-test stage. The test result being meaningful and the higher increase in the rate of the right answers indicate that test group students taught through GIS supported training are more successful than the control group students taught through the traditional teaching methods. The findings obtained can be interpreted that both methods have increasing effects on the student's success.

The graphic indicating the correct answer means of the test and control group students placed in the Figure 1.

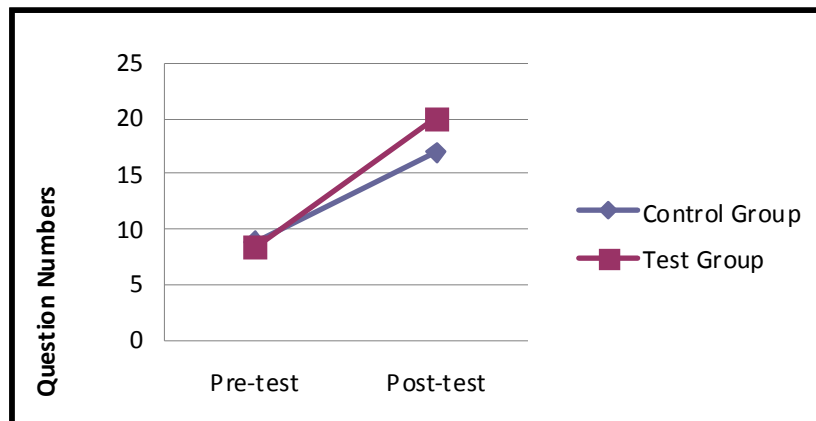


Figure1.The Graphic Belonging to the Means of the Pre-test/ Post-test Scores of the Groups

RESULT AND DISCUSSION

In this study it is conceived that the test group students who learned the "Climate of Turkey" issues in the 9th grade through GIS based activities are more successful than the control group students who learned the same issues according to the traditional teaching methods. At this point, it is concluded that geography teaching supported with GIS based activities increases the success. This result supports some studies conducted in Turkey and abroad (Kerski, 2000; Oner, 2011; Crabb, 2001; Balciogullari, 2011; Johansson, 2003; Pitts, 2005; Yurdam, 2013; Cameron, 2005; Demirci, 2006; Tiyekli, 2007; Kocak, 2007; Aladag, 2007; Karatepe, 2007; Clark, Monk & Yool, 2007; Cepni, 2013; Turkez, 2009; Ugurlu, 2007; Simsek, 2007; Ozgen & Cakicioglu, 2009). These studies point out that the usage of GIS in the Geography lessons is important for the enrichment of teaching, enabling the geography teaching more effective and comprehensible and providing the students a more lasting learning. Supporting the activity focused learning and being practical can make geography teaching easier and effective. It can also affect the learning motivation of the students positively as a positive influence. Besides, the students can be provided a multi-dimensional learning with the help of GIS and they can make a casual relationship among the notions they have learned. In this study, it was noticed that the students were more eager in the lessons carried out with GIS based activities. Students' being active in the lessons, the lessons' being done in practice far away from memorizing, and the lessons' being funny and enjoyable were effective in the increase of test group students' success. The subjects were demonstrated by making the abstract subjects concrete which made a positive effect on students' better learning of the subjects.

By the help of GIS the students are provided with an active role in their learning process and putting forth a product as a result of the application made their learning more permanent. So, the students will more easily adapt the information they gained to the daily life by doing and living without memorizing. GIS enables the students to gain the skills of problem solving, analyzing and questioning, carrying out a research, critical thinking, studying in a group and communicating which is another reason for GIS to be used in the lessons. By the use of GIS in the Geography lessons the students will take place in a more active teaching process. With the benefit of GIS the students will be able to create their own maps; they will be able to provide new information formation by basing on the principle of cause-effect and distribution. Because the students analyze their own maps in GIS supported education, they will be grown up as individuals who search, think critically and make interpretations. Thus, their learning becomes meaningful and permanent.

Geography teaching and researches are not only a field application but also they are studies generate the practical and usable results. This situation led to the applied geography to develop today. Applied geography by doing the measurement, analysis and synthesis through technological equipments achieves acquiring information and using this information by organizing them. GIS helps this process. As long as the relation between the human and geography carries on, geographical information system will consistently take place in human life. In our age which has become the age of information and technology geographers should absolutely have a wide knowledge of information and experience about the geographical information systems (Oner, 2011).

In the result of the some studies (Johansson, 2003; Cameron, 2005; Demirci, 2006; Tiyekli, 2007; Kocak, 2007; Aydın & Kaya, 2010) it is proved that there are some obstacles in front of the GIS application in education. The inadequacy of the physical and technical conditions in schools, being expensive of GIS software, deficiency of enough lesson hours, having not enough in-service training of teachers on this subject, planning needed for GIS based education being time consuming are among these obstacles.

Based on the findings obtained from this study the followings are suggested:

)} The traditional teaching methods (lecturing, question-answer) reduce the effectiveness of the students during the lessons and it also prevents them to express themselves. Because of this reason teaching techniques enabling the students active should be used in the Geography lessons. GIS based practices will help the students to attain the education and training environment also to learn by doing and living while helping them to learn the subjects visually. In this study it was noticed that the use of GIS in the Geography course increases the interest and the curiosity of the students to the lesson and makes the lesson funnier and more enjoyable. So, the teachers can be suggested to give a much more place to this method in their lessons.

)} Creating a database needed for the materials that will be prepared via GIS, getting the database appropriate for the software, making an appropriate planning to the lesson will take a long time. This will cause the teachers not to be willing to use this method. If the database needed for the studies is created beforehand these activities will be able to be realized in a short time and with a less costing. In addition GIS based lesson materials and course plans

should be prepared for the Geography course by National Education Ministry.

} Geography teachers should be informed in GIS through in-service training seminars and encouraged to apply this method. Infrastructure necessary for this work to be performed.

} In this study the effectiveness of GIS on "Climate of Turkey" issues of the 9th grades of the secondary education was researched. The validity of this method should be proved by searching the effectiveness of GIS on the other subjects of the Geography course. Besides, GIS should also be practiced in the other grades of the secondary education.

} This study was applied to two groups of the 9th grade students in the vocational high school category. This study is suggested to be applied for different school categories (General High Schools, Science High Schools, Anatolian High Schools in Turkey). The success levels of the students attending to the schools presenting education service for the students with different abilities can be compared in this way.

} GIS is quite expensive software. So, it is not possible for the teachers to undergo such a financial burden alone. Even if the teachers learn to use GIS through in-service training to buy the software will be extra costly for them. Thus, GIS software should be bought by National Education Ministry to be loaded to the computers at schools. On the other hand, information technology classes having the capacity to carry the GIS program should be organized in schools.

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