Available online at ijci.wcci-international.org

International Journal of Curriculum and Instruction 9(1) (2017) 31–46

IJCI
International Journal of Curriculum and Instruction

Development of Teaching Materials Based on Geographical Information Systems: An Example on Symbolic Sites in Turkey

Özlem Yağbasan[a]*, Kübra Eren [b]

[a] *Gazi University, Faculty of Gazi Education, Department of Geography Education, Ankara 06500, Turkey*
[b] *Ahmet Çiçek Vocational and Technical Anatolian Highschool, Ankara 06946, Turkey*

Abstract

In the present study, ArcGIS program, widely utilized Geographical Information System (GIS) software, was used to outline the stages of material development for geography courses. The aim was to provide the teachers with an example on how to develop materials using GIS rather than developing materials for all topics of the geography courses. In that context, the basics of how to use the "Hyperlink" feature were provided through a step-by-step approach. The geography teachers may easily develop their own materials by following the foregoing stages explained in the paper. These materials may help improving the attention and attitudes of students towards courses significantly and ensure that the topics are better understood.

© 2016 IJCI & the Authors. Published by *International Journal of Curriculum and Instruction (IJCI).* This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (CC BY-NC-ND) (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Keywords: Geographical information systems; teaching materials; symbolic sites; hyperlink feature

1. Introduction

1.1. Background and Overview

Since its birth, humanity continually faced with developments and changes. Such developments and changes especially occurred in Information and Communications Technology (ICT). In the era of information, the rapid changes in ICT have had impacts on the field of education along with all the social systems and paved the way for the development of new methods and techniques in education. Knowledge increases continuously and rapidly in the era of information making it difficult to teach students all the knowledge. The new program fostered major changes. Subsequent to the introduction of the new teaching program, teaching how to access and use knowledge

* Corresponding author: Özlem Yağbasan. Tel.: +90-312-202-1872
E-mail address: ozlemy@gazi.edu.tr

became more important than teaching the knowledge itself, replacing a teacher-centered system, which considered students merely a knowledge-receiving structure (Balcıoğulları, 2011).

There are problems associated with teaching geography as experienced in almost all countries. Occasional modifications to the teaching programs aimed to meet the expectations of the society as regard of the teaching issues considered problematic. The changes in the geography-teaching program as implemented from 1941 to 2005 did not provide any changes or novelties, but simply added or omitted certain topics. The most fundamental change in the geography-teaching program was introduced in 2005, in the light of the improvements in ICT. The geography program of 2005 was developed in accordance with the constructivism theory, which is based on the construction of knowledge in mind and its main goal is "teaching to learn."

The new geography-teaching program aimed to help forming "geographical consciousness" (Karabağ & Şahin, 2007). The previous education programs were merely composed of titles and course names towards classification of geographical topics away from forming such consciousness. Aiming to have students continually active through intra- and extramural activities and such practices as tours and observations, the education program was designed to help students with acquiring multiple geographical skills.

The most significant contribution of the education program was the emphasis on the use of such technologies as the GIS, Google Earth, and Global Positioning System (GPS) during the geography courses. Use of GIS technologies in the secondary education was first introduced in the USA, and subsequently similar practices spread to Canada, many other European countries, and Turkey (Yomralıoğlu, 2000). Having targeted by nature to understand the relationship between space and different spatial characteristics, and thus to develop the skill of spatial thinking, the geography courses incorporated GIS as a major education tool for students and teachers, today (Keiper, 1999; Lee & Bednarz, 2009; Milson & Earle, 2007). Thanks to GIS, the students better understand the characteristics of the space, spatial concepts, and the geographical events occurring together with their causality relations. The most important contribution of GIS in the geography courses is transforming the oral, textual abstract information into concrete and visual information for ensuring efficient and permanent use for the students.

The visual materials help students in developing more positive attitudes towards the geography courses; therefore it is of utmost importance that the geography teachers should utilize GIS. The adverse effects of rote learning may be mitigated as far as possible by efficient use of GIS, making children completely active in the geography courses. The children can easily engage in various activities and develop new ideas, state one's opinions, ask questions, and seek answers to them through research while acquiring knowledge.

The present study aimed to popularize the use of GIS in the secondary education geography courses and to provide the materials, which are to be developed using the GIS, and contribute in geography teaching. Accordingly, answers to below questions will be sought clearly:

1. What is the use of materials in geography teaching?
2. Why does GIS technology important in geography teaching?
3. What is the contribution of the developed GIS-based "Symbolic Sites in Turkey" in the use of materials in geography teaching?

The materials are put into use in the teaching-earning process to support teaching. Materials that fit to the topic and purpose liven up the topic that is being taught, enrich the teaching process, and improve learning. At the same time, the materials help with extending the areas of interest of the students and raising their motivation. Materials are used to provide multiple learning environment and help by meeting the individual needs of the students, for providing easy remembering, transforming abstract things into concrete, ensuring time savings, and sustaining safe observation opportunity. Materials are also important for the fact that they allow presentation of inter-consistent contents at different times, that they are reusable, and that they facilitate understanding by simplifying the content (Demiralp, 2007).

Geography is perceived by the students as learning the capital cities of the countries and being familiar with the names of rivers, mountains, and plains, etc. In order to demonstrate that geography is not such a course, it is very important to develop more visual and permanent materials and present them by means of GIS. Adequate field knowledge is not sufficient for an educator to perform his or her teaching activities. Educators should "learn to teach" and apply to various methods to that end. Use of materials is one of those methods. Materials facilitate narration and comprehension. Generally, such materials as maps, atlas, and globes are used in the geography courses. Unfortunately, GIS-based materials are not widespread in the secondary education institutions. This is because of the fact that the teachers are not adequately informed about the information system technology, combined with inappropriate environment for its implementation.

The present study focused on the spaces included in the "UNESCO (United Nations Educational, Scientific and Cultural Organization) World Cultural Heritage List" in Turkey. The cultural heritage is the previous generations' legacy works that need to be protected, which has significant universal value and represents the effects of the previous civilizations. The effects of the civilizations are maintained to the extent of the richness of their artistic and cultural heritage. These values establish bridges between the past and future and allow inter-generation communication. Having an understanding of the

past and owning the values will help with both meditating on, and correcting the deficiencies of today.

1.2. Material Use and Importance of GIS in Geography Teaching

Geography is a branch of science that studies the interaction between human beings and the natural environment. As regards of that interaction, first the close environment and the conditions and then the world should be taught in detail. The crucial elements of geography teaching are plainness and clarity. Introduction of knowledge should only be left behind in order to ensure a productive geography education / teaching. The students should be allowed to use what they have learned during the geography course in daily life. This goal can be rather attained by the help of materials and exemplifications. Therefore, the geography course may no longer be perceived as rote learning and it may become a favorite branch of science at the same time.

The teaching materials are all tools, instruments, and resources that are used to develop knowledge, skills, attitude, and values in students (Yaşar, 2004). Teaching becomes lively, fluent, and permanent if as many sense organs are addressed during the education-teaching process. The use of material is important in geography teaching since the geography courses are rather suitable for more "visualization" and learning by applications, and experiences. Geovisualization is defined as "visibly use of the very powerful information processing skills by humans through visualizing spatial subjects and issues, using concrete visual presentations" (Taş, 2006). Materials that are used in accordance with the learning outcomes in the classroom environment may help with livening up students' attention, facilitating the work of the teacher, and ensuring more permanent learning.

As emphasized by Demirel et al. (2004), developing and using teaching materials are sometimes more useful than using ready materials. This is because of the fact that the teachers often avoid using teaching technologies. For many teachers and students, it is better to teach by self-designed and developed materials. The students, who prepare their own course materials, will acquire highest level of cognitive, kinesthetic, and affective skills that they will be get knowledged about the material produced and the related course, due to their activity in the course of material development, and finally when they come up with an original product that belongs to them.

The "New Geography Course Teaching Program" introduced many novelties in terms of content, approach, and understanding. Having been developed on the basis of constructivist approach, the new education program keeps students away from rote learning and allows their involvement in the teaching process and construes permanent knowledge. Students are encouraged for asking questions, conducting research and planning, and it is aimed to have students acquire critical thinking skills, creative thinking, communication and empathy, problem-solving, decision-making by using

information technologies, and entrepreneurship skills along with such skills regarding geography course as preparing and interpreting maps, observation, field study, geographical inquiry, charts, graphs, and diagrams, perceiving time, change and continuity, and using evidence (Aydoğmuş, 2010).

The new education program recommends the use of GIS along with the maps, photographs, films, CD-ROMs, simulation, multimedia, and hypermedia that are in use of teaching geography. The use of GIS is recommended as regards of certain learning outcomes emphasizing the fact that teachers may develop GIS practices or review available examples depending upon the technical equipment and physical facilities of the schools. The education program stresses that the people who "produce knowledge" and "use knowledge" have an undisputable superiority in the present and that the most important task in acquisition and use of information, and raising equipped manpower is to be assumed by the educational system (MEB, 2005).

GIS is the entirety of the computer-based systems used for the purposes of geographical inquiries. The students may quickly and accurately find answers to their questions regarding the objects and events surrounding them by means of GIS. Thus, GIS is an efficient tool that helps with use and analysis of the data entered into the information system and finding visual solutions to the raised questions. GIS has two primary functions for the geography courses. The first is helping the students with understanding the subject in question. The students learn by entering the related data into the information system, then followed by processing and analysis in GIS. At the same time that mentioned practice is not rote learning as generally encountered in today's geography courses, and the learning takes place by conceiving the events by cause and effect relationship and in connection with the daily life. Therefore, the students set aside rote learning, intake of a great deal of information, and acquire the knowledge by being conscious of why there are important in the framework of their active roles and relations to their surrounding spaces (Sui, 1995). The second and the most important function of GIS is that it helps students with developing multiple skills.

A student using GIS acquire a variety of skills throughout his or her activity. These can be outlined from the beginning to the last phase as follows: data collection, data production, research, methodology, capability of the use of data collection tools, developing data collection methods, working individually or in a group, verifying the accuracy of data, using hardware and information technology, developing statistical understanding skills, digitizing data, transforming observations in numerical data, ability to make associations among the data, comparison, analysis, finding the shortest way to the end, producing data using the existing data, finding the safest and shortest ways in problem-solving, visualizing data in the form of maps, graphs, and charts, interpreting the maps, graphs, and charts, ability to make three-dimensional and spatial analysis, making cause-effect analyses, and assessment of the results (Malone et al.

2003). These skills, to which many others can also be added upon a more detailed examination, consequently feed important skills in children. GIS is the use of knowledge through the shortest and the rightest way in solving the everyday problems and facilitating the real life (White & Simms, 1993).

Geography seeks answers to such questions as what, where, how, and why. Finding the answers to such questions, and performing analyses and syntheses are rather fast and easy by GIS for secondary school students (Kerski, 2003; Lemberg & Stoltman, 2001). Therefore, GIS use in teaching geography has become an important issue of consideration. Acquisition of the skill of developing teaching materials for geography courses using the GIS by geography teachers and educators may play an important role in removing the current deficiency in the development of teaching materials. It should be aimed to make geography courses more productive for both the teachers, and students, and improve the multiple skills of the students by means of GIS.

2. Method

2.1. Study Model

The survey model was used in the study. The opinions of geography teachers as regards of the material use in geography teaching were examined. Survey model aimed to describe the opinions, attributes of large masses. Such studies mostly help to answer such questions as 'What,' 'How,' and 'To which level'.

2.2. Data Collection and Analysis

A literature research on GIS was conducted first and the course materials in order to develop GIS-aided course material were obtained. The research tried to collect information as regards of the importance of GIS-based course materials for educational activities in geography education. ESRI ArcGIS 10.3 software was used in digitizing the collected data and producing the related maps in order to develop GIS-based course material. The data was associated with "hyperlinks" and analyzed in the "Results" section in detail. "Hyperlink" is a type of link / function, which provides the users to access another application or website.

3. Results

The present study was designed so as to contribute in the popularization of GIS among geography teachers and provided the geography teachers with basic insight into how to develop teaching materials that are directly associated with the learning outcomes provided for in the geography course teaching programs. The study focused on the locations in Turkey that were included in UNESCO World Cultural Heritage List,

including the year 2016, regarding the "Symbolic Sites in Turkey" topic as provided for in the 12th grades geography teaching program. Natural formations, monuments, and sites with international importance and thus worthy of admiration and protection have been granted with the status of "world heritage" (Uygur & Baykan, 2007). The candidate places are granted such status upon decision of World Heritage Committee as a result of a series of processes that commences with an application by a signatory member state filed to UNESCO and finalized upon the assessment of the specialists from International Council on Monuments and Sites (ICOMOS) and International Union for Conservation of Nature (IUCN). As of 2016, there are 1052 cultural and natural sites throughout the world, which have been included in the UNESCO World Cultural Heritage List, with 814 cultural, 203 natural, and 35 both cultural and natural sites. 16 sites from Turkey have been included in the UNESCO World Cultural Heritage List as a result of the efforts conducted under the responsibility of the General Directorate of Cultural Assets and Museums. Below is a list of the assets included in the UNESCO heritage list in Turkey by date of entry:

1) Historic Areas of Istanbul (1985),

2) Great Mosque and Hospital of Divriği (1985),

3) Göreme National Park and the Rock Sites of Cappadocia (1985),

4) Hattusha: the Hittite Capital (1986),

5) Nemrut Mountain, Adıyaman (1987),

6) Hierapolis-Pamukkale (1988),

7) Xanthos-Letoon (1988),

8) City of Safranbolu (1994),

9) Archaeological Site of Troy (1998),

10) Selimiye Mosque and its Social Complex (2011),

11) Neolithic Site of Çatalhöyük (2012),

12) Pergamon and its Multi-Layered Cultural Landscape (2014),

13) Bursa and Cumalıkızık: the Birth of the Ottoman Empire (2014),

14) Diyarbakır Fortress and Hevsel Gardens Cultural Landscape (2015),

15) Ephesus (2015),

16) Archaeological Site of Ani (2016).

In the study, pictures and related information about the sites included in the UNESCO list were displayed on a map of Turkey, making the abstract knowledge more permanent in the memory by means of GIS software.

3.1. Developing Material Example

First, ArcMap interface is opened in the computer. Then, the shape files of "TUR_adm0.shp" and "TUR_adm1.shp" are displayed by clicking the "Add Data" button as shown in the Figure 1.

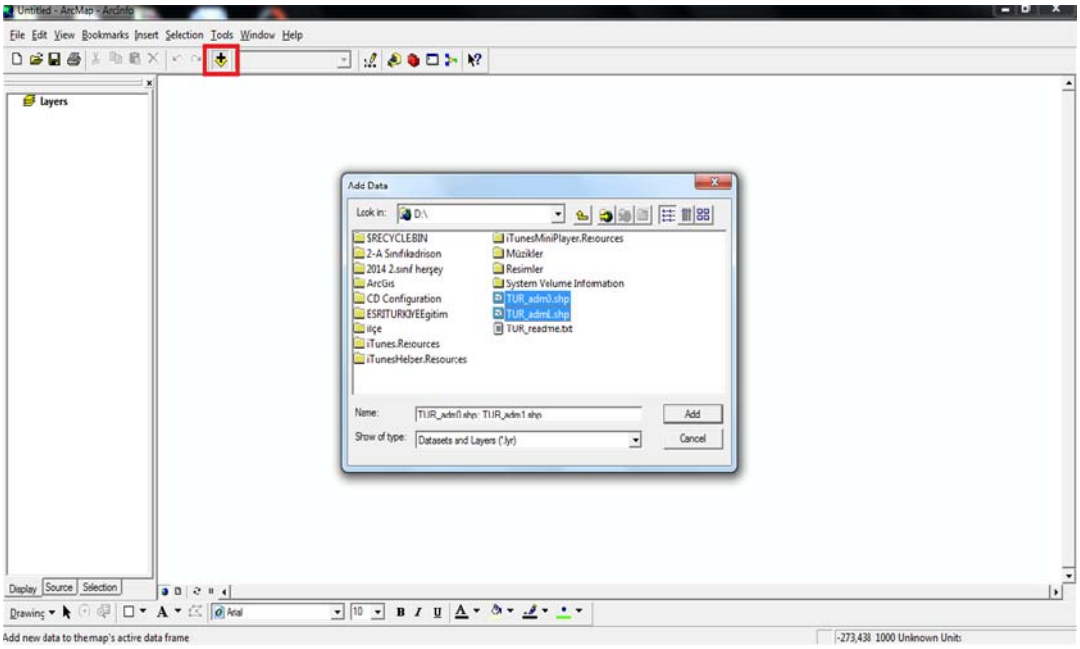


Figure 1. ArcMap interface, adding layers

"Countries layer" should also be retrieved from the related folder in order to display the pieces of land around Turkey. Note that "Turkey layer" should be above of the "Ulkeler" (= "Countries" in English) layer (Figure 2). If not, it should be dragged to bring forward.

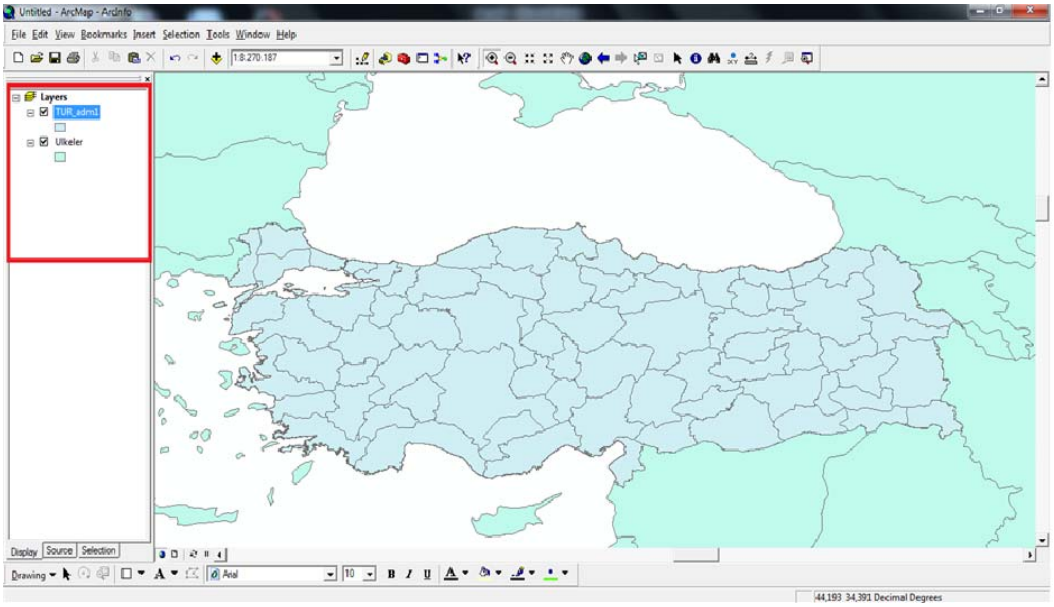


Figure 2. Layers view in ArcMap interface

In order to display the names of the cities and to show cities in different colors on the map, right click the mouse over “Turkey” layer, select “Name” from “Labels-Labels Field tab” in the “Properties” section and click “Apply” (Figure 3). If the names of the cities are not displayed in the screen, right click the “Turkey” layer again to see whether the “Label features” is active or not (Figure 4).

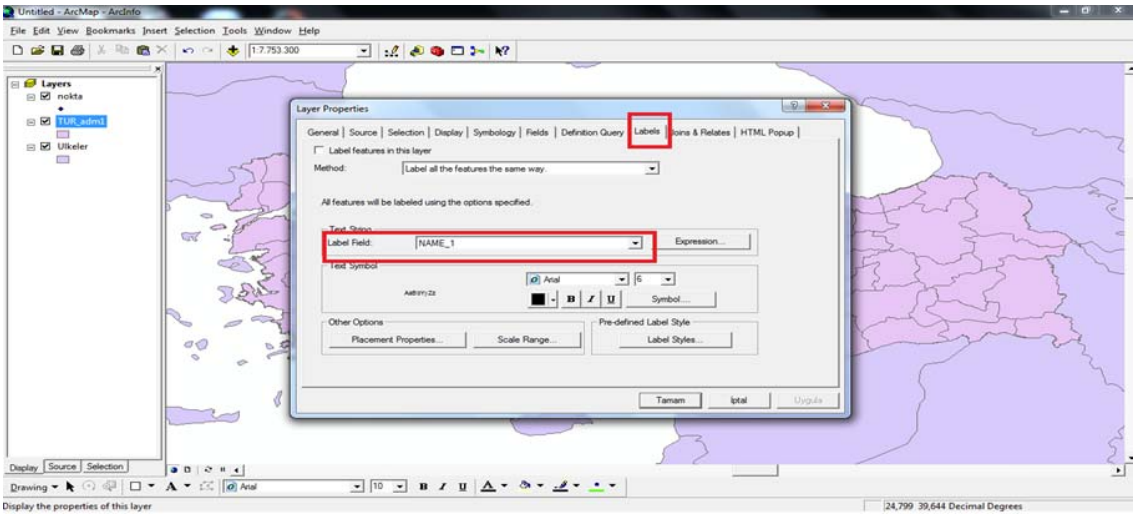


Figure 3. Display of the cities

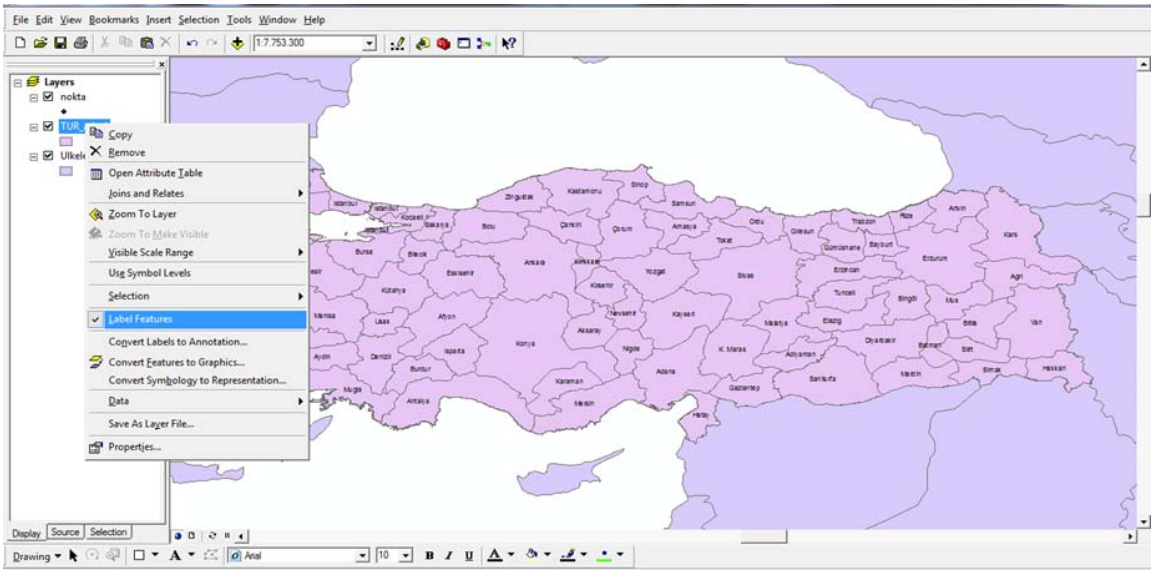


Figure 4. Checking “Label features” tab

Then, right click “Turkey” layer and click “Layer Properties”, select “NAME_1” as the “Value Field” domain in the “Categories” tag of “Symbology” (Figure 5). Select color from the adjacent “Color Ramp” and click “Add All Values” to apply in all cities (Figure 6).

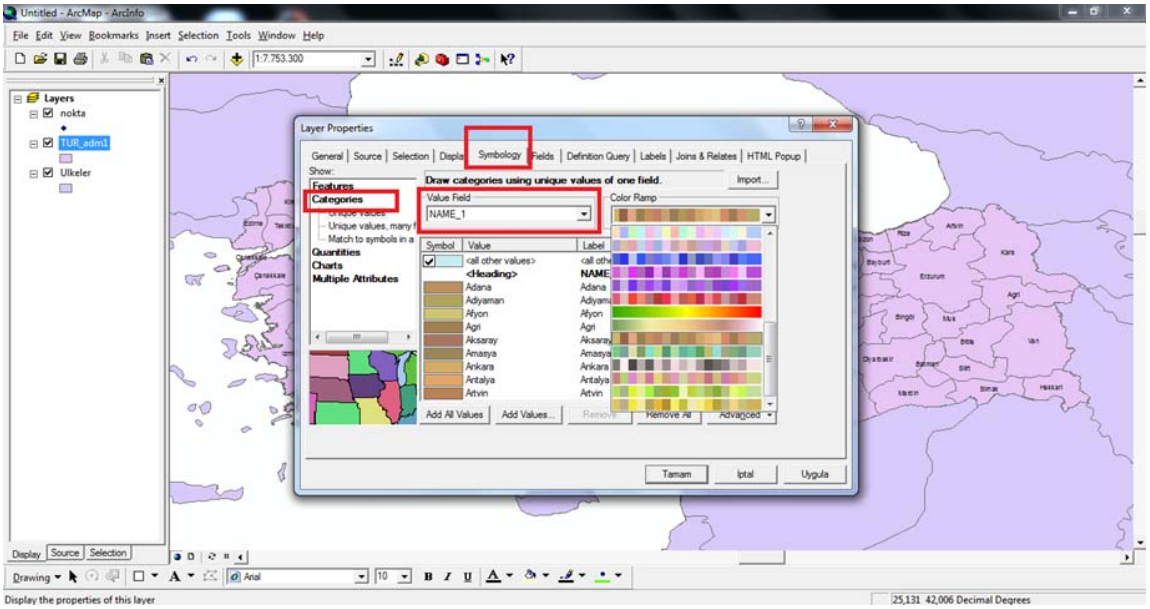


Figure 5. Displaying cities in different colors

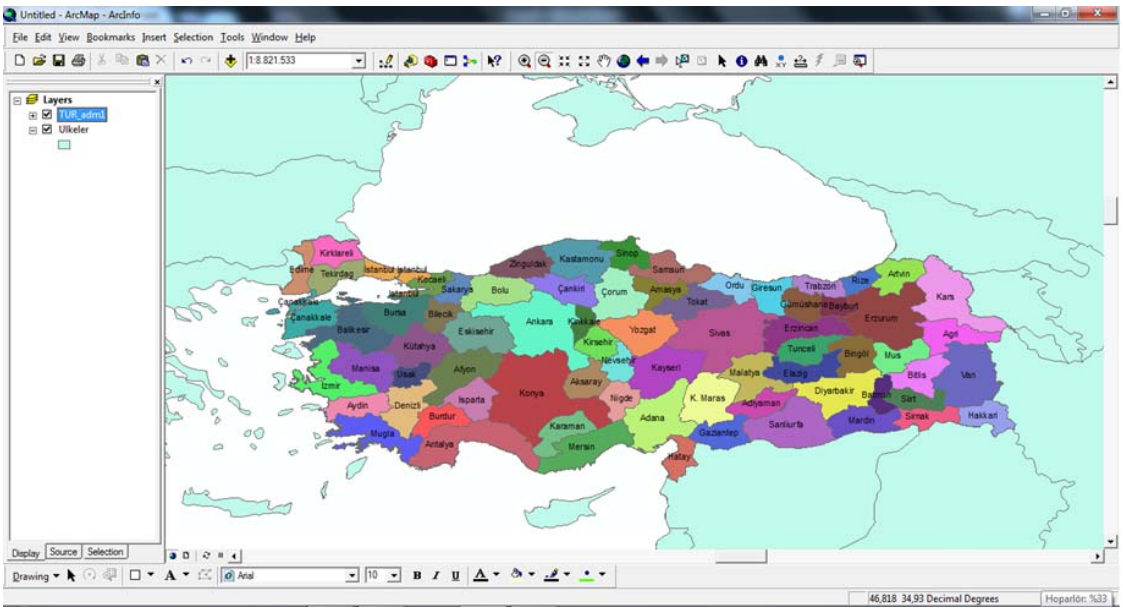


Figure 6. View of cities in different colors

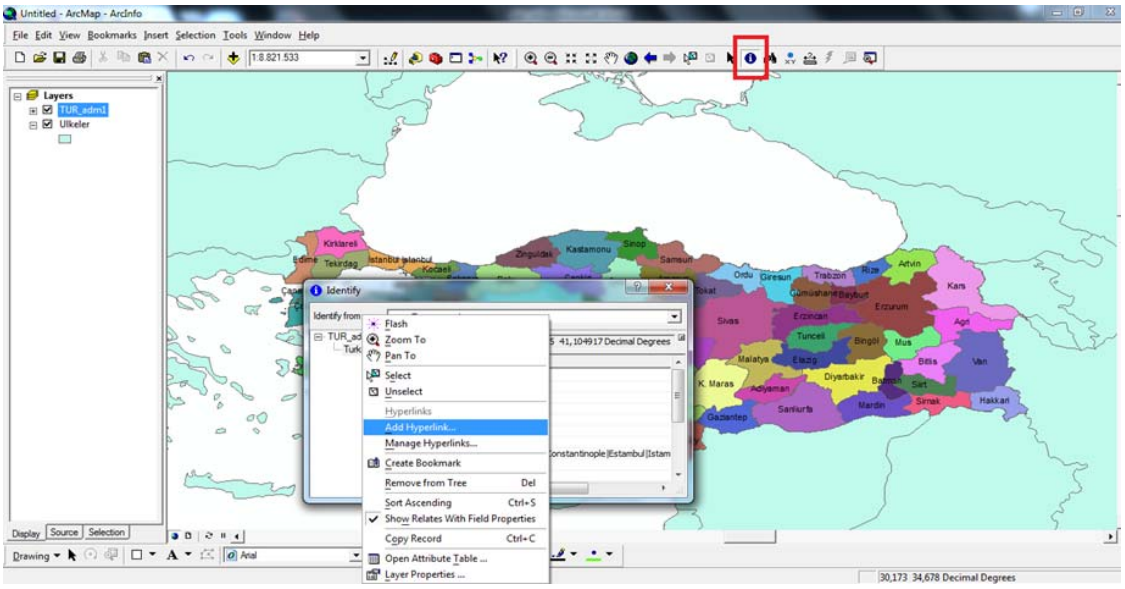


Figure 7. Activating the “Hyperlink” icon for adding pictures and information

In order to add pictures and information to the Historic Areas of Istanbul as identified in the UNESCO world heritage list, make an inquiry on the Istanbul city by help of “Identify” icon (Figure 7), right click “Turkey” layer in the pop-up window, then click “Add Hyperlink” to add picture, video, etc. from the computer with “Link to a Document” section (Figure 8).

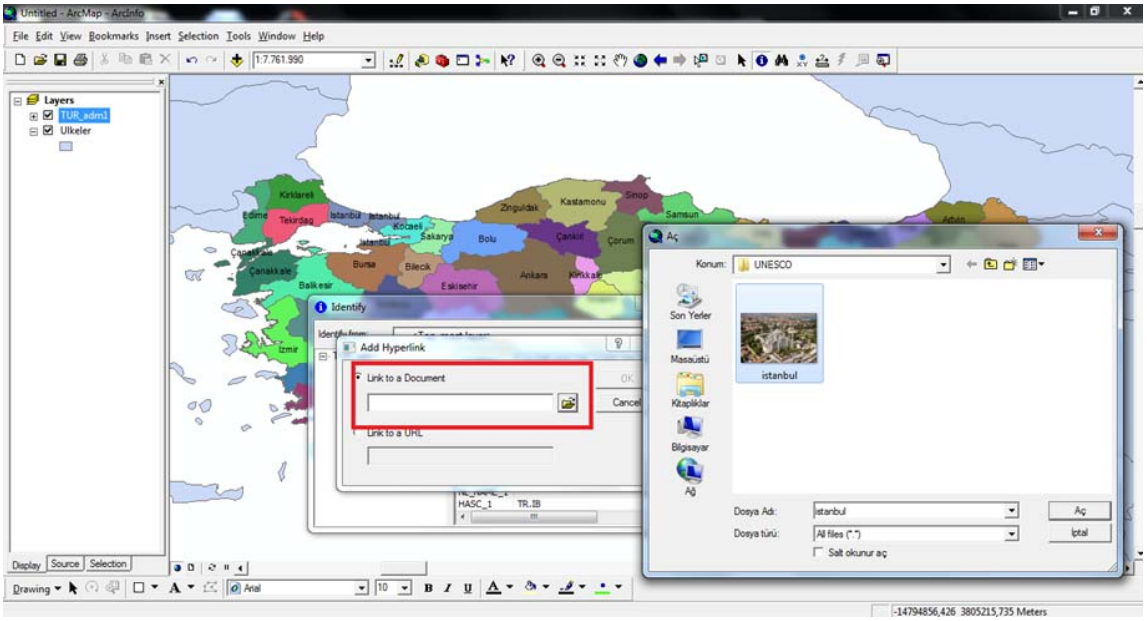


Figure 8. Link to a Document

Moreover, websites can also be added for information purposes via “Link to a URL”. Website links can easily be added by pasting the copied URL address into the “Link to a URL” section (Figure 9).

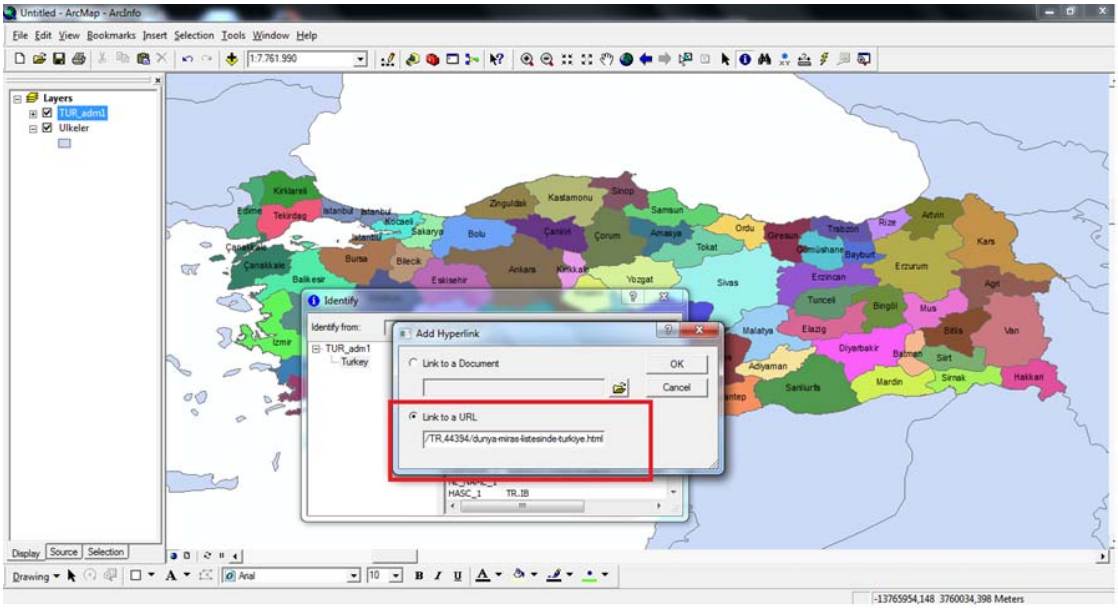


Figure 9. Link to a URL

Afterwards, the “hyperlink” icon in ArcMap interface “Toolbar” will be activated after the application of aforementioned operations (Figure 10).

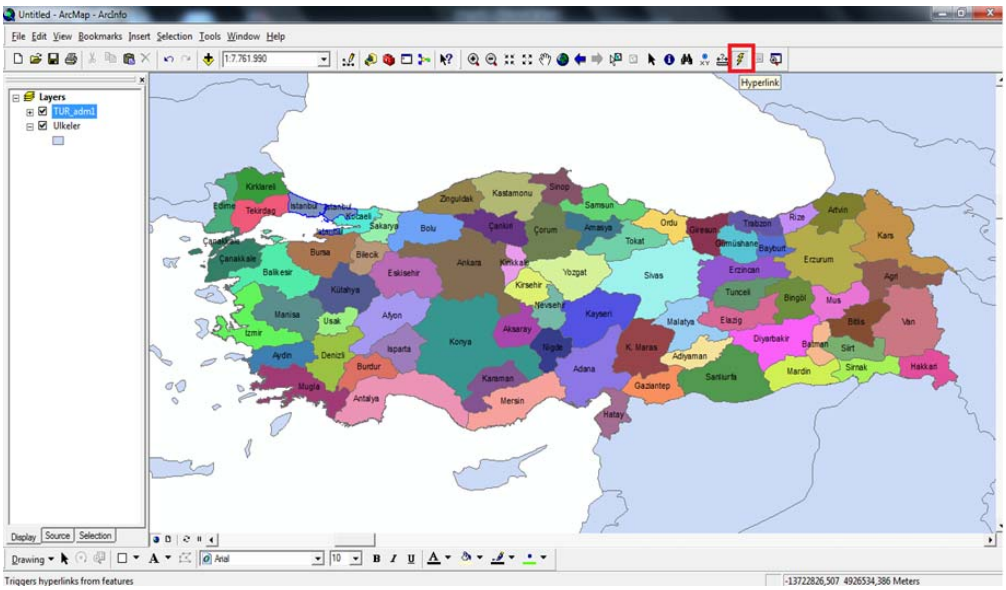


Figure 10. Activation of “Hyperlink” icon

When it is clicked on the City of Istanbul with the “activated hyperlink” icon, added pictures and the websites will be displayed. There are two files in the hyperlink, in the pop-up window. When the above command is activated, the picture will be displayed (Figure 11). When the below is clicked, the website will be displayed (Figure 12).

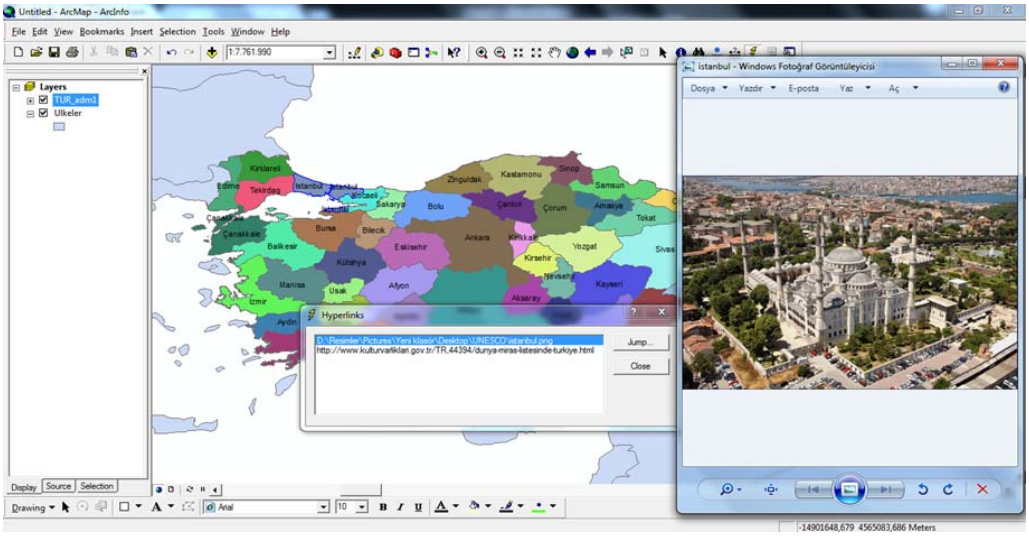


Figure 11. Hyperlink, activating the added picture

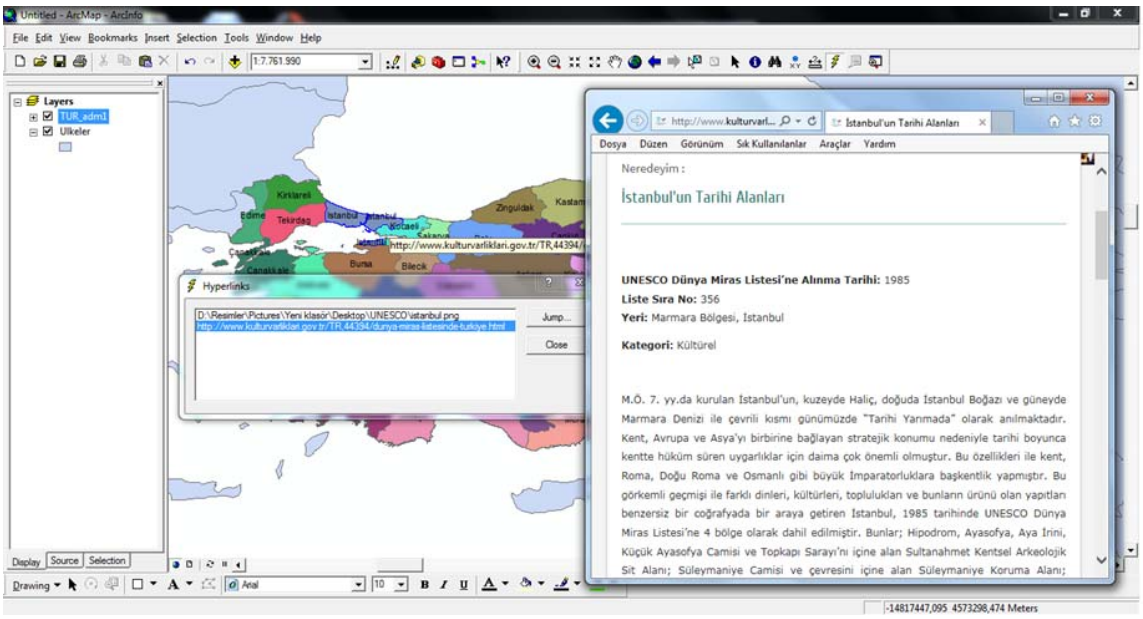


Figure 12. Hyperlink, activating the website

4. Discussion

GIS has many pedagogic advantages for students and teachers at secondary schools, especially in geographic education. The atlas, globes, and maps are the most frequently used tools for the purpose of conveying visual knowledge in the geography courses. The students are contented with accepting what has been offered by the teacher rather than getting familiar with, recognizing, and analyzing their surrounding landscape. This unsolicited situation can easily be resolved by applications of GIS.

In the present study, an example material was developed regarding the important assets of our country, which were included in the UNESCO World Heritage List. There are 16 sites from Turkey that were included in the UNESCO World Heritage List. The UNESCO World Heritage List sites are generally taught as based on the information from books in the conventional method. However, GIS-based teaching would provide more effective and permanent learning since the relevant studies showed that the GIS-based course presentations were more successful when compared with the conventional methods. Unfortunately, in conventional methods, the way which geography is taught sets aside questioning, observation, and interpretation capabilities of the students. The students who used GIS technology developed higher cognitive skills according to Bloom's taxonomy, when compared with the students who did not. Therefore, GIS technology should be used as an effective pedagogic tool to improve the high level of learning skills of the students.

5. Conclusions

The aim of the study was to provide GIS-based material for teachers with an example on how to develop materials using GIS for "symbolic sites in Turkey" topic of the geography courses. In that context, the basics of how to use the "Hyperlink" feature were provided through a step-by-step approach. The study showed that GIS-based applications can be used at schools successfully to support permanent geographic education. The geography teachers may easily create their own materials by following the explained example material development steps. These materials may help improving the attention and attitudes of students towards courses and ensure permanent learning. However, the successful inclusion of GIS into a secondary level education requires adequate infrastructure and software, in-service training and instructional material to support the standards, and appropriate courses in the educational curriculums in the educational institutions.

References

Aydoğmuş, Y. (2010). *Coğrafi Bilgi Sistemleri (CBS) Uygulamalarının Coğrafya Dersinde Öğrencilerin İlgi, Motivasyon ve Öğrenme Düzeylerine Etkisi* [The impact of Geographic Information Systems (GIS) Applications on the students' interest, motivation and learning levels], Master Thesis, Marmara University, Institute of Education Sciences, İstanbul.

Balcıoğulları, A. (2011). *Coğrafi Bilgi Sistemleri destekli coğrafi düşünme becerileri öğretiminin öğrencilerin coğrafi düşünme becerilerine, akademik başarılarına ve bunların kalıcılığına etkisi* [The impact of geographical Information Systems aided teaching of geographical thinking skills on the students' geographical thinking skills, academic achievements and their permanence], Doctoral dissertation, Çukurova University, Institute of Social Sciences, Adana.

Demiralp, N. (2007). Coğrafya eğitiminde materyaller ve 2005 coğrafya öğretim programı [Materials in geography education and 2005 geography curriculum], *Kastamonu Eğitim Dergisi, 15*(1), 373-384.

Demirel, Ö., Seferoğlu, S. & Yağcı, E. (2004). Öğretim teknolojileri ve materyal geliştirme [Developing teaching technology and material], *Pegem Publishing house*, Ankara.

Karabağ, S. & Şahin, S. (2007). Kuram ve uygulamada coğrafya eğitimi [Geography education in theory and practice], *Gazi Publishing house*, Ankara.

Keiper,T.A. (1999). GIS for elementary students: An inquiry into a new approach to learning geography. *Journal of Geography, 98(*2), 47-59.

Kerski, J.J. (2003). The implementation and effectiveness of Geographic Information Systems technology and methods in secondary education. *Journal of Geography*, *102*(3), 128-137.

Lee, J. & Bednarz, R. (2009). Effect of GIS learning geospatial thinking. *Journal of Geography in Higher Education, 33*(2), 183-198.

Lemberg, D. & Stoltman, J.P. (2001). Geography teaching and the new technologies: Opportunities and challenges. *Journal of Education*, *181*(3), 63-76.

Malone, L., Palmer, A.M. & Voigt, C.L. (2003). Mapping Our World; GIS lessons for Educators, *ESRI Press*, USA.

MEB. (2005). Coğrafya Dersi Öğretim Programı [Geography Course Teaching Program], *Milli Eğitim Bakanlığı Talim ve Terbiye Kurulu Başkanlığı*, Ankara.

Milson, A. J. & Earle, B. D. (2007). Internet-based GIS in an inductive learning environment: A case study of ninth-grade geography students. *Journal of Geography*, *106*(6), 227-237.

Sui, D.Z. (1995). A pedagogic framework to link GIS to the intellectual core of geography. *Journal of Geography*, *94*(6), 578-591.

Taş, İ. (2006). Coğrafya eğitiminde görselleştirmenin önemi [The importance of visualization in geography education], *Doğu Coğrafya Dergisi*, *16*(1), 211-237.

Uygur, S. & Baykan, E. (2007). Kültür turizmi ve turizmin kültürel varlıklar üzerindeki etkileri [Cultural tourism and effects of tourism on cultural assets], *Gazi Üniversitesi Ticaret ve Turizm Eğitim Fakültesi Dergisi*, *2*, 30-49.

White, K.L. & Simms, M. (1993). Geographic Information Systems as an educational tool. *Journal of Geography*, *92*(2), 80-85.

Yaşar, O. (2004). İlköğretim sosyal bilgiler dersinde güncel materyal kullanımı ile coğrafya konularının eğitim ve öğretimi [Education and teaching of geography topics in primary school social studies course, using recent material], *Milli Eğitim Dergisi*, *16*(1), 104-119.

Yomralıoğlu, T. (2000). Coğrafi bilgi sistemleri: Temel kavramlar ve uygulamalar [Geographic Information Systems: Basic concepts and applications], *Seçil Publishing house*, İstanbul.

Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the Journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (**CC BY-NC-ND) (http://creativecommons.org/licenses/by-nc-nd/4.0/**).