

Full Length Research Paper

Using geo-spatial technologies for field applications in higher geography education

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Today's important geo-spatial technologies, GIS (Geographic Information Systems), GPS (Global Positioning Systems) and Google Earth have been widely used in geography education. Transferring spatially oriented data taken by GPS to the GIS and Google Earth has provided great benefits in terms of showing the usage of spatial technologies for field applications conducted in both secondary school and higher geography education. As a result, natural environment becomes an open laboratory, and is not just a place to be seen in pictures or where one travels to. At the same time, all kinds of spatially oriented data obtained from the natural environment have been shown, collected and analyzed in practice by geo-spatial technologies. This study shows how GIS, GPS and Google Earth can be integrated in field application lessons in geography education.

Key words: Geo- spatial technologies, geography education, field applications.

INTRODUCTION

Field application is widely used for geography education. The field can be considered as the laboratory for geographical researches (Meydan and Dinç, 2009) that, "geography is written while walking" has become a common saying among geographers. Geographic research is enhanced when one walks around natural environment, observes and notes human and physical geography features. Observations must be recorded permanently in order to shed light on future studies. Today, geo-spatial technologies make it easier to record such observations.

Researchers use geo-spatial technologies to analyze natural and human geography features by capturing geographic data (Karatepe, 2007). Geographic Information Systems (GIS), remote sensing (RS), global positioning systems (GPS) and on-line spatial data tools, Google Earth are commonly used geo-spatial technologies. By means of these geo-spatial technologies, geo-data can be collected, stored and analyzed for mapping. Data production is needed to conduct analysis by using geo-spatial technologies. That is why field trips and studies are required (Kaya et al., 2008).

In the secondary education geography curriculum of

2005 in Turkey, it is encouraged and recommended that field studies should be done and geo-spatial GIS technology should be used (MoNE, 2005). From that time, different methods have been developed by researchers regarding the use of geo-spatial technologies in geography lessons (Demirci, 2008; Demirci et al., 2011; İncekara et al., 2008; Tuna, 2012). Developments in geo-spatial technologies make it possible to use different kinds of equipment and methods in geography lessons. With these developments, several activities can be put into practice by using GIS, GPS and Google Earth in geography lessons (Johansson, 2006; Demirci and Karaburun, 2010). This study shows how GIS, GPS and Google Earth technologies can be used in field studies of geography education at university level.

Aim of the study

The aim of this study is to show practically how geo-spatial technologies are integrated with "Field Applications" lessons instructed in higher geography education.

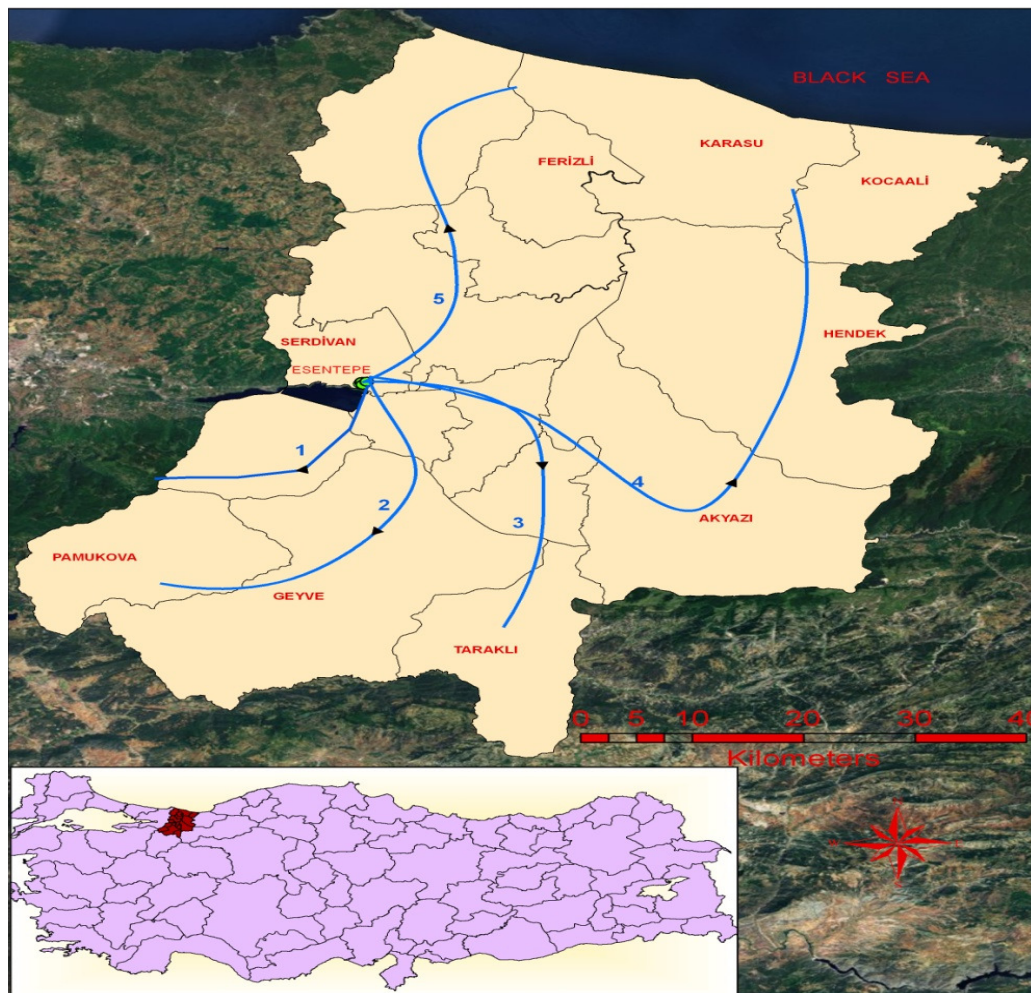


Figure 1. Study area location and route map for field trips.

MATERIALS AND METHODS

Study area

The author chose Sakarya Province and its surrounding areas as the general study area for this work. Five specific locations were selected outside Sakarya University, Esentepe Campus (Figure 1), because these specific places have been chosen for field trip applications courses at the Department of Geography in Sakarya University yearly. So Esentepe Campus of Sakarya University was chosen as an example lecture for teaching how to use GPS for field trip applications.

Within three months, after the example of campus work, one-day field trip was organized to these specific locations. During the field trips, geological and geomorphological features and also population, settlement and agricultural activities of the study are given to the students. In addition to these, during field studies, some of the geo-data locations were collected with GPS device by students.

There were 41 students in the group. Students recorded the points to GIS and Google Earth programs. After study, the students were asked to bring their jobs to the lecturer on time.

We used 2 Magellan GPS devices, ArcGIS 10.0 programmers and Google Earth 6 software in the field during the study.

The study has 4 phases: (a) preparation phase, (b) field phase, (c) laboratory phase and (d) evaluation phase.

Phases of the study

Preparation phase

General information about GIS, GPS and Google Earth's working mechanism was given and previous studies were presented in the classroom. The GPS device was introduced to the classroom with information about device adjustments.

Field phase

The field phase starts with the beginning of the trip and ends when it finishes. This phase includes all practices (Garipağaoğlu, 2001).

Using the knowledge and information gained during classroom lessons, students recorded the location points they take with the GPS device at the five different locations aforementioned (Figure 2). Two Magellan branded GPS devices were used during field work to record location points. The coordinate system of one of the devices was adjusted as geographical (degree minute second) and the other was adjusted as UTM (Universal Transfer Mercator). This



Figure 2. Collecting coordinates with GPS device.

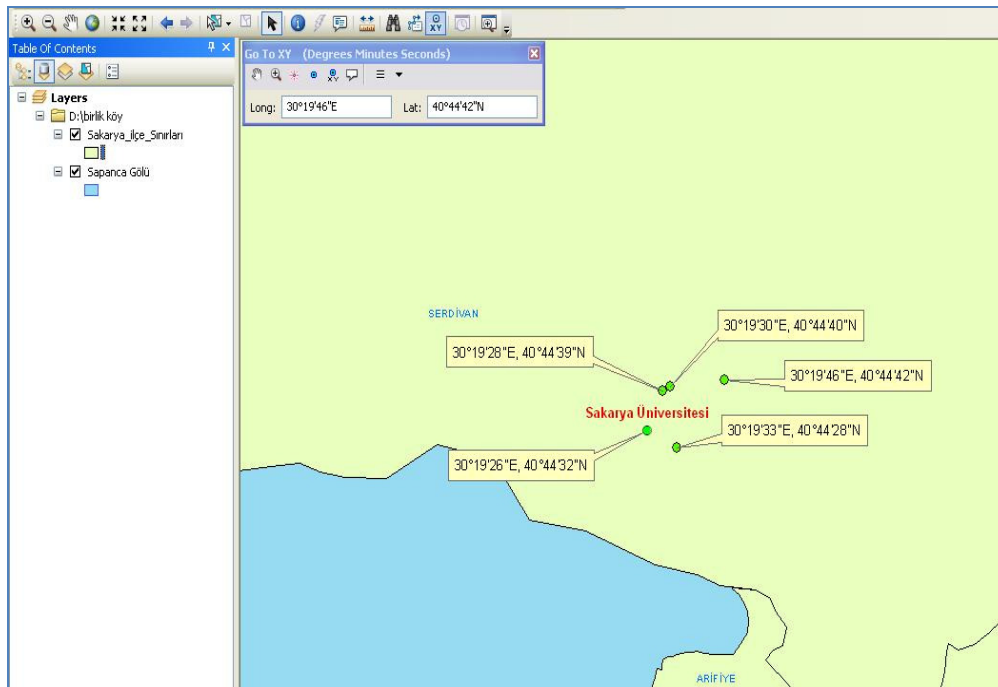


Figure 3. Transferring the locations to ArcMap Interface of ArcGIS.

way, students were able to take location points according to both coordinate systems. This was repeated at each of the other five locations. Every student was provided with the opportunity to collect location points with GPS device. During the field phase they collected random points simply to gain experience using GPS.

Laboratory phase

Both geographical and UTM coordinates that students collected on the university campus were used during lab phase. The number of computers was not enough so the class was divided into two groups in order to provide each student with one computer.

As a base map, “Turkish provincial borders” and “Sakarya provincial border” shape files were used to transfer the location points on map via ArcGIS program. Locations were transferred to map with “Go to XY” button on ArcMap interface (Figure 3).

Locations collected with GPS were transferred to the ArcMap by using “go to XY point” command. By selecting “Layer” on Data Frame and using “Convert Graphics to Features” command, points were converted to vectors with the name of “GPS_locations” (Figure 4).

GPS points saved as shape file were converted to Google Earth file “KML” extension by using ArcToll Box which is an ArcGIS application. For this, ArcMap interface Toolbox feature was used.

Sub-commands “Conversation tools”, “To KML” feature, “Layer to

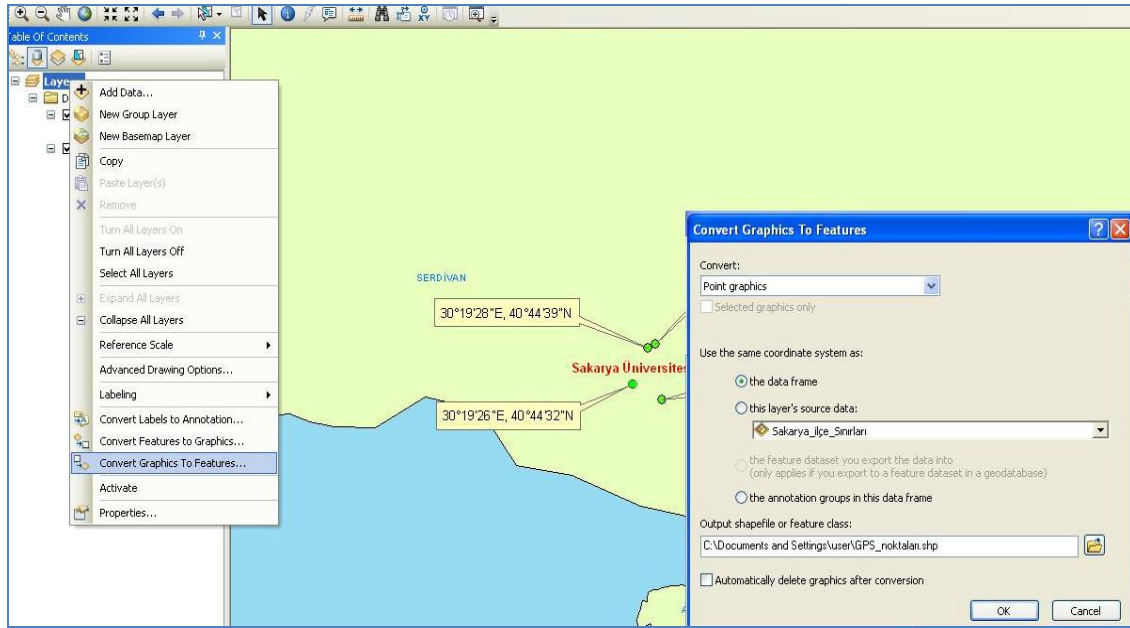


Figure 4. Converting the points into vectorial shape file folder.

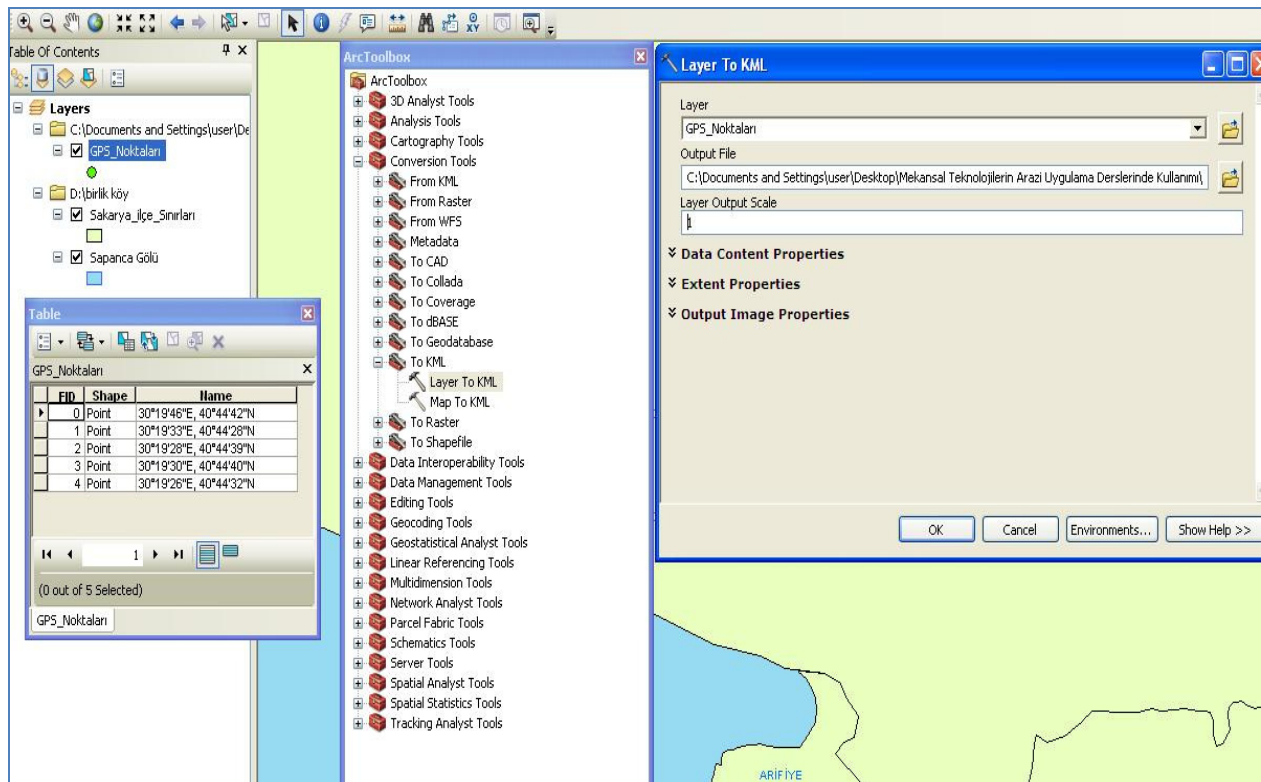


Figure 5. Converting vectorial data into Google Earth files by using ArcToolbox.

KML” command was chosen (Figure 5).

By writing GPS points to the layer section, field_points to Output file section and “1” to layer output scale section on “Layer to KML” window processing was completed (Figure 5). As a result,

“GPS_Points” shape file extensions were converted into “GPS_Points.kmz” files for opening in Google Earth program. In order to open this new kmz file on Google Earth program, click “open file” and click kmz file to view the map created (Figure 6).

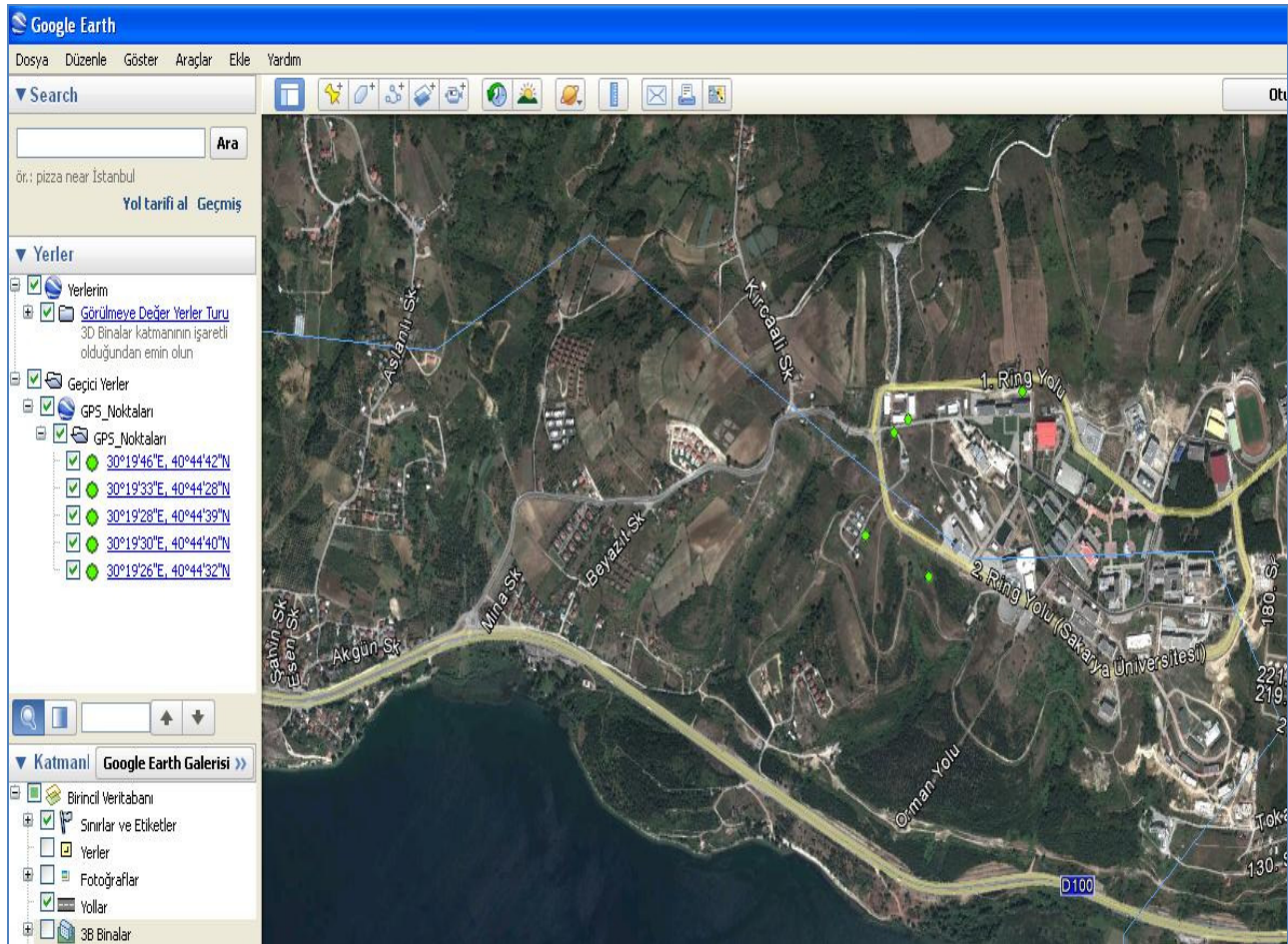


Figure 6. Viewing the points on Google Earth.

Evaluation phase

In the evaluation phase, students were asked to transfer the points they collected from five different places in Sakarya, first to GIS and then to the Google Earth program shown in laboratory phase during the three months term. They were asked to record 20 different points from different places to a Google Earth file with their names (Figure 7).

In addition to these, students were asked to explain all the phases of their tasks. Firstly, to make points table derived from the study area. After that show them in ArcMap and then convert to shape file. Finally they were asked to send all points to the Google Earth as a kmz file.

At last, students were asked to create a folder with their names. Then save all files (collected points table, shape file, Google Earth file, etc) in this folder. And then they were asked to bring the folder to the lecturer on time. Of the 41 students in the class, 38 delivered their studies on time. This means 92% success. The 3 others also made their tasks but they did not finish and deliver their task on time. Due to this, we did not accept their jobs to be valid.

RESULT AND SUGGESTIONS

Geo-spatial technologies are used in every branch of geography but especially have important place in field

studies because of the importance of geo-data.

Geographical and spatial data that are gathered with GPS device are transferred to GIS and Google Earth programs in labs. Students learn how to operate geo-spatial technologies in field studies. In this manner, all spatial data gathered from the natural laboratory of geography are recorded and can be used to shed light on future studies.

The aim of this study is to show practically how geo-spatial technologies are integrated with "Field Applications" lessons instructed in higher geography education. There were 41 students in the group. Students recorded the points to GIS in the first place and to Google Earth program after that. This way, students learn the topic practically and not theoretically. It is observed that, 92% of students completed their assignment with success.

Increasing the number of such studies and making geography more practical will help geography take its well-deserved place in science. This kind of practical study in university level education will help students to begin a career well equipped. So, to know and to use geo-spatial technologies will give an extra opportunity to

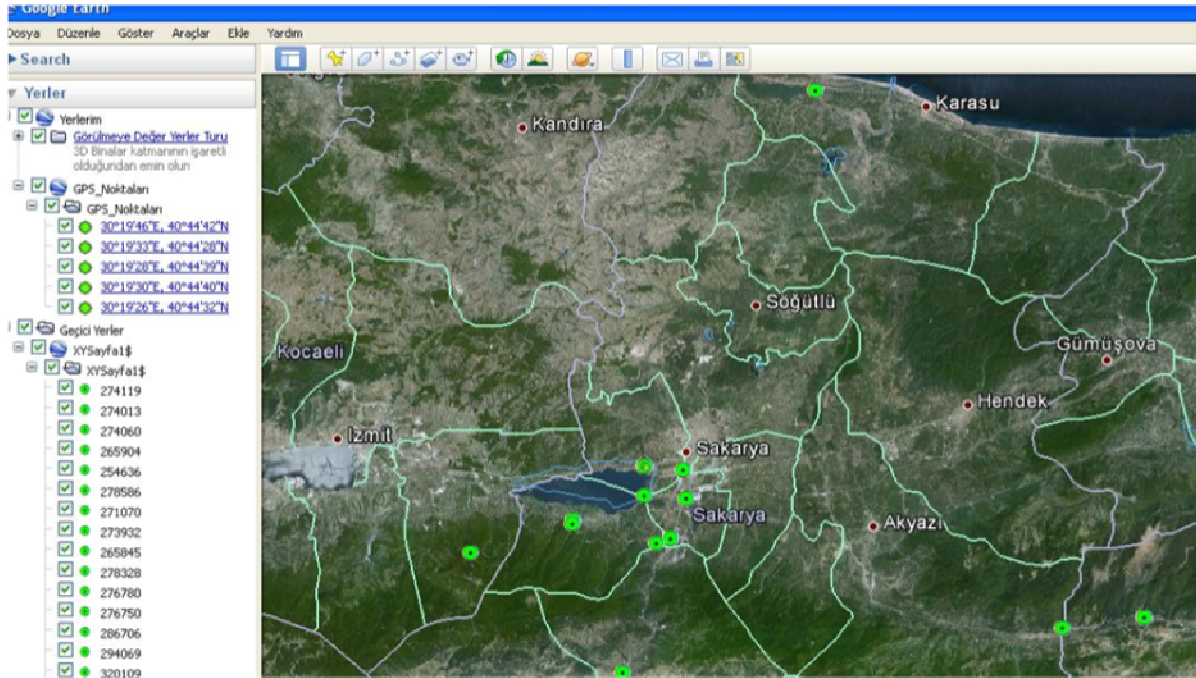


Figure 7. A view from the student's applications.

them for having better job and salary.

REFERENCES

- Demirci A (2008). Evaluating the Implementation and Effectiveness of GIS-Based Application in Secondary School Geography Lessons. *Am. J. Appl. Sci.* 5(3):169-178.
- Demirci A, Karaburun A (2010). Using GIS, GPS, and Google Earth Technologies in Geography Lessons. *Marmara Geogr. Mag.* 24:99-123.
- Demirci A, Karaburun A, Ünlu M, Özey R (2011). "Using GIS-Based Projects in Learning: Students Help Disabled", *European J. Geogr.* 2(2):48-60.
- Garipağaoğlu N (2001). Place of Field-Observation Method in Geography Education. *Marmara Geogr. Mag.* 3(2):13-30.
- İncekara S, Karatepe A, Karaburun A (2008). Evaluating the Implementation and Effectiveness of GIS-Based Application in Secondary School Geography Lessons. *Marmara Geogr. Mag.* 17:97-110.
- Johansson T (Ed) (2006). *GISAS project: Geographical information systems applications for Schools.* Finland: University of Helsinki.
- Karatepe A (2007). *Using Geographical Information Technologies for Geography Education.* Unpublished phd thesis: Marmara University Institute of Education Sciences: İstanbul.
- Kaya H, Demirkaya H, Fatih A (2010). Undergraduate Students' Experiences in a Geography Fieldwork". *Middle-East J. Sci. Res. (ISI)*. p. 637-641.
- Meydan A, Dinç A (2009). Importance of Field Applications in Geography Education. IV. Social Sciences Education Conference. Report Book, Marmara University: İstanbul.
- MoNE (2005). *Secondary Geography Education Curriculum in Turkey.* Ministry of National Education Press: Ankara.
- Tuna F (2012). "An Analysis of Students' Knowledge and Perceptions of Geographic Information Systems (GIS) in Turkey". *Ozean J. Appl. Sci.* 5(3):209-220.