TESTING THE USE OF GOOGLE MY MAPS IN A HUNGARIAN SECONDARY SCHOOL

Judit Kiss, José Jesús Reyes Nunez

Department of Cartography and Geoinformatics
Faculty of Informatics, Eötvös Loránd University
Pazmany Peter setany 1/A, Budapest 1117, Hungary
Tel: +36 1 372 2975 Fax: +36 1 372 2951
E-mails: judit1992@gmail.com, jesusreyes@caesar.elte.hu

Abstract
In the last years numerous research projects were developed in relation to the use of web-based map services in teaching activities. Their results inspired the authors to organize a research project testing how collaborative cartography can support Geography teaching at secondary level. Thirty-one pupils of a secondary school in Budapest participated in a survey divided into three parts: a questionnaire to determine their knowledge on web mapping services, a theoretical presentation and a practical lesson to make a map using Google My Maps. Pupils also created their own maps on topics related to the Geography of Water, working in teams of two persons. In general, the experience working with the pupils can be considered positive: the maps evaluated as high, appropriate and average can be considered not only works of good quality, but also including personal solutions to improve and organize their content.

Keywords: Collaborative cartography, children, Google Maps, Geography, secondary school

INTRODUCTION

The year 2005 is considered by some specialists a milestone date in the history of cartography, when the public map services appeared on the Web. It was the first time that a relatively accurate map with relatively recent satellite images of any territory on the Earth could be used by any person without any direct cost. First the Google Maps and Google Earth, and later other services as Open StreetMap began to be used by tens of thousands of people all over the world for diverse daily tasks: from looking for a building (e.g. a theatre or museum) to finding an address that they want to reach. In a few years these new solutions were also discovered by research institutes, universities and schools. Numerous studies related to the new map services were developed in different countries and new denominations and concepts enriched our professional vocabulary: volunteered geographic information (VGI), user generated content, mass geography, neo geography, collaborative cartography, geotagging, etc. The research activities of these services were developed in manifold application areas, including teaching activities from Elementary-level to Undergraduate Education. At same time it should be remarked that collaborative cartography, collaborative mapping or map-based collaboration are not new concepts that emerged after the appearance of map services on the Web. Researchers can find numerous examples on collaborative cartography at schools, using more “traditional” (e.g. non computer-based) solutions to encourage the work of pupils organized in groups or teams. Beginning from the decade of 1990, firstly computer-based and later web-based collaborative work was also introduced to Elementary and Secondary Schools. A project developed between 2003 and 2004 (just before Google made public its map service) can exemplify the solutions experimented within this area of collaborative map-based work. It was developed by Prof. David Owen, from the Sheffield Hallam University (United Kingdom) and it counted with the participation of 80 children from grades 3 to 5 of Primary School (7 to 10 years old). They were organized in teams of two pupils to draw a map with software used in English schools. The content of the map was an area around the school, a walking trail visiting four places of interest for a new children and shading areas based on three levels of interest, showing parts of the route that are very busy, busy or quiet. Best results were obtained in the age group of 9 to 10 years, pictorial symbols were preferred over abstract symbols and texts were barely used on the maps (Owen 2005).

These results and mainly the latest experiences obtained in other countries on the use of web-based map services in schools motivated the authors to organize a research project on the alternatives that can be offered by collaborative cartography to support the Geography teaching in Hungary.
PRELIMINARY RESEARCH

Only a year after Google Maps appeared on the Web, Patrick Wiegand (2006) wrote in his book entitled “Learning and teaching with maps” that “we need to identify progression in learning and teaching in relation to new technological tools… We also need a revision of our map related curricula… Web cartography offers both opportunities and challenges for schools”. Inspired on this statement, during the current project our aims were to find answers to questions as:

- How can web-based map services increase children's interest in Geography?
- How can they be used to enrich children's knowledge and experience in more conscious use of maps?
- How can these services be used to support Geography teaching in Hungarian secondary schools?

The initial idea was to introduce pupils (and teachers) to the use of at least an easy web-based mapping application, which could be a useful tool for the basic representation of a selected theme on a map service. The preliminary research was divided into two parts:

- Research to determine which web-based map service should be taught during our meeting with the pupils
- Analysis of Geography curriculum to determine those themes that can be represented on maps

The authors decided to use Google Maps and a Google-based application as the web map service to be taught for the pupils. Our decision was taken after consulting the international bibliography on this topic as well as analysing the statistics collected in international surveys realized in the last five years, which can be found on different websites free of cost. These statistics show that Google Maps has been the most popular map service continuously in the past years. Only two examples are listed below:

- In the second quarter of 2013 Google Maps was chosen as the most-used smartphone application in the world by the Statista portal, exceeding Facebook by 10% and YouTube by almost 20% (Figure 1)
- During a survey organized by the Nielsen Company, Google Maps was the most popular map service used by more than 105 Million average unique users between January and October of 2016 (Figure 2)
Authors consulted earlier bibliography related to this topic as well as other research projects on the use of web-based map services in the educational activities at Elementary and Secondary level, which were developed in different countries in previous years. Reyes (2016) also researched on the use of Google Map and Earth in teaching activities, specifically how them could be used e.g. in the mobile version of school atlases.

Other works illustrated the efforts made to find the most appropriate solutions for their use adapted to the specific conditions in a country. One example is a project based on the use of Google Earth to represent data collected by pupils on their home-school route, which was developed by Iomara Barros de Sousa in the municipality of São Gonçalo (Niterói, Rio de Janeiro) in 2013 (Barros 2014). The survey was developed during two months, with the participation of 64 to 70 pupils from two classes of 7th grade (second level of Brazilian Primary Education). Pupils had the opportunity to practice the use of GPS receivers, to collect data related to important buildings and other sights that they can find in their route to the school, as well as asking people on their opinions on the pollution of a canal and river flowing across the municipality.

The study of curricula on Geography for Hungarian secondary schools as well as textbooks used at this level was other important task before beginning the organization of the survey. The study of curricula was needed to define the level of knowledge and competences of pupils (OFI 2012). Textbooks and workbooks written for grades 9 and 10 were read to determine those possible themes that could be represented by the pupils on their maps (Arday, Nagy and Sáríné 2016; Arday and Molnárné 2016a, 2016b; Arday, Kőszegi, Sáríné and Útőné 2016).

ORGANIZATION OF THE SURVEY

Researchers contacted a secondary school in Budapest to begin this stage of the project. The selected school can be considered an educational institution with merits recognized at national level. After arranging the possible date for the survey (ending March), we consulted the participating Geography teachers to determine those themes that can be proposed for the pupils to create their own maps. Our choice was the chapter entitled “Geography of Water”, because it is the theme taught during the month of March according to the plan of studies. After studying the content of this chapter, researchers drew up a list of 25 themes to be proposed for the pupils. Our main aim was to include not only themes related to Budapest and Hungary, but also to all the most relevant issues on Geography of Water that can be found over the world. The preliminary list was approved by the Geography teachers involved in the project. Some of

<table>
<thead>
<tr>
<th>RANK</th>
<th>APP</th>
<th>AVERAGE UNIQUE USERS</th>
<th>TOP % CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FACEBOOK</td>
<td>146,037,000</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>FACEBOOK MESSENGER</td>
<td>129,579,000</td>
<td>28</td>
</tr>
<tr>
<td>3</td>
<td>YOUTUBE</td>
<td>113,738,000</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>GOOGLE MAPS</td>
<td>102,419,000</td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>GOOGLE SEARCH</td>
<td>102,419,000</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>GOOGLE PLAY</td>
<td>99,773,000</td>
<td>8</td>
</tr>
<tr>
<td>7</td>
<td>GMAIL</td>
<td>88,522,000</td>
<td>36</td>
</tr>
<tr>
<td>8</td>
<td>INSTAGRAM</td>
<td>74,972,000</td>
<td>18</td>
</tr>
<tr>
<td>9</td>
<td>APPLE MUSIC</td>
<td>68,992,000</td>
<td>36</td>
</tr>
<tr>
<td>10</td>
<td>AMAZON APP</td>
<td>65,338,000</td>
<td>43</td>
</tr>
</tbody>
</table>

Note: The list is ranked on average unique audiences, which is the average of January 2016 - October 2016. The year-over-year percent change represents the unique audience of October 2016 compared to the unique audience of October 2015.

Source: Nielsen Mobile Netview 3.0
themes were as follows: Thermal baths in Budapest, Europe's famous thermal baths, areas threatened by inland waterways in Hungary, flood risks on the Danube, the world's most well-known canyons, the Great Lakes region in North America, the tragedy of the Aral Lake, areas taken from the sea in the Netherlands, estuaries and their role in the economy, the Andes' glaciers, the Panama canal, hurricanes and typhoons, disasters caused by tsunamis and the Earth's longest mountain glaciers, among others.

Because of the limitations derived from a very accurate plan of studies, researchers disposed of only one turn of class (45 minutes) for this activity. A work plan was arranged to make the most of the time that were at our disposal:

- Preliminary survey to determine pupils' knowledge related to the use of map services on the Web (10 minutes)
- Theoretical introduction: Google world (10 minutes). Presentation summing up the history of Google from 2005 and introducing its most important applications.
- Practical example and homework: How to make an own map using Google My Maps (25 minutes). The original idea was to explain how users can make an easy thematic map searching for data on the Web and using Google Fusion Tables. However, because of the limited time available for the practice, our decision was to show the options offered by a simpler Google application: namely Google My Maps, which perhaps is better known by the public in general, however it does not offer real mapping tools, allowing only some basic operations (e.g. measure of distances) and to complement the map with multimedia information.

![Figure 3. Making a Google map together with the pupils during the our visit to the Secondary School](image)

DEVELOPING THE SURVEY

The survey was carried out in the Mihály Fazekas Secondary School in Budapest on March 31, 2017. The use of a computer room for our presentation and practice was ensured and a 9th grade group formed by 31 pupils (8 girls and 23 boys) participated. The age of the participants was 14 years (7 pupils), 15 years (23 pupils) and 16 years (6 pupils).

Beginning the class the pupils answered a short questionnaire of three questions to measure how they are acquainted with the map services available on the Web. By practical reasons (to facilitate the analysis of the results) in each question some options were given to select one or more of them:

- Which web-based map services do you know? (Google Maps, Google Earth, Open Street Map, HERE Map, other)
- What did you use the map service for? (Route planning, excursion, to determine your location at that time, to find a home address, to place a photo to the map, other)
• Which subjects could you propose for the use of map services? (Geography, History, Literature, Biology, other)

The authors gave a brief presentation to introduce pupils to Google Maps and its applications, making emphasis on the explanation on Google My Maps, which is a web-based tool to add information (data, text, photos, etc.) to any objects represented by symbols, lines or areas on Google Maps.

After the presentation, teachers and students made together an example using Google My Maps (Figure 3). It was a map on the Fertő-Hanság National Park, which is placed on the frontier between Austria and Hungary (Figure 4). During the practice, teachers highlighted how to give a title and a short description to identify our map, how to create our own layer structure to organize the represented information, how to define symbols that are designed according to the represented theme, how to delimit areas on the map and a very important option: how to link specific information (data, text, images, videos, etc.) to the created symbols and areas. Other options taught were how to change the default base map to any of the nine options offered by Google, how to measure distances and how to determine routes (directions) using the appropriate tools, as well as how to share the map in the social media, how to embed the map to an own website or how to export it to KML or KMZ format for its visualization using Google Earth.

Figure 4. Fertő-Hanság National Park on Google Maps: example used to show how to create a map with the Google My Maps application

Finishing the practice, fourteen teams of two pupils and a team of three pupils was organized for the homework, which was the making (using Google My Maps) of their own map on a preferred topic selected from the 25 themes related to the Geography of Water. They had a month to make the map. The tasks to accomplish when solving the homework were as follows:

• to collect textual and multimedia data on the selected theme
• to choose appropriate symbols and colours according to the characteristics of the objects related to the selected theme
• to add the collected information to the map using symbols and areas
• to organize the symbols, areas, etc into thematic layers created by themselves
EVALUATION AND ANALYSIS OF THE RESULTS

Survey on using web-based map services

The first part of the process of evaluation of answers was dedicated to determine the results of the short questionnaire on web-based map services filled by students before beginning the teaching activities.

The answers given to the first question (Which web-based map services do you know?) reaffirmed the authors’ decision to develop the project using Google Maps and a Google application: All the 31 pupils chose Google Maps and 26 of them Google Earth as the best known map service. Only 4 students answered Open StreetMap and 4 Here Maps.

Evaluating the results of the second question (What did you use the map service for?), we can see that there is clearly a majority in choosing two options against the others: 31 pupils selected as main activity the planning of a route, while 28 used the map service to find an address. The same number of pupils (19) used the map service to determine their actual position and to plan a trip. Surprisingly, only 5 pupils uploaded a photo to a map-based service.

The answers given to the last question (Which subjects could you propose for the use of map services?) were also clear and definite: 29 pupils chose Geography and 27 History, 9 pupils Informatics, 8 pupils Biology and 4 pupils Literature. A total of 18 pupils proposed other subjects too, standing out Informatics with 9 votes. Other subjects also received a non-relevant number of votes, as can be seen on Figure 5.

![Figure 5. Diagrams showing in detail the answers given to the 3rd question of the survey](image)

Making of Google maps

Pupils created thirteen maps using Google My Maps; two teams did not send their maps. The themes represented on the maps were: Meeting point of the Amazonas and the Negro river, the estuary of Amazonas, the tragedy of the Aral Lake, flood risk along the Danube River, areas threatened by inland waterways in Hungary, thermal baths in Budapest, the source of the Danube, areas taken from the sea in the Netherlands, the world's most well-known canyons, the Great Lakes region in North America, the Panama canal and lakes in the Scandinavian Peninsula. A collage of four maps made by the pupils is presented in the Figure 6.

The maps were evaluated according to the specific criteria determined in four categories: the use of symbols, colours and layers as well as the grade of detail and accuracy of the collected information, considering if they linked or not text, data and images to the objects located on the maps (Table 1). The results within each category were assessed as high, appropriate, average and lower within each category. These results were averaged to give an overall qualification to each map.
Figure 6. Examples of maps made by the pupils

Table 1. Criteria for the evaluation of categories used in the Google map

<table>
<thead>
<tr>
<th></th>
<th>Layers</th>
<th>Symbols (Pictograms, lines, polygons)</th>
<th>Colours</th>
<th>Data and image</th>
</tr>
</thead>
</table>
| High | - New layers were created  
     - Layers were named according to the theme | - Use of non-default pictograms according to the represented theme –  
     Use of polygons and lines in a geographically accurate location and on the appropriate layer | - Use of colours according to the theme | - Use of data and image linked to the symbols |
| Appropriate | - Use of more than one layer, but happened that it was not renamed according to the theme | - Use of pictograms according to the selected theme, but some default symbols were also used unjustifiably.  
     - Location is geographically accurate on the appropriate layer | - Use of colours according to the theme, but default colours can be also found unjustifiably on the map | - Not all the symbols had linked data and image (within a limit of 20%) |
| Average | - Only the default layer was used, but it was renamed according to the theme | - Only used default symbols, with accurate location on the renamed layer | - Every object was filled with only one, but non-default colour | - The percent of symbols without data and image was between 50 and 80 |
| Lower | - Only the default layer was used and it was not renamed | - Only default symbols were used on the default layer | - Only default colours were used | - More than 80% of symbols were not linked to data or image |

Overall result:
- General qualification based on the average of results obtained by categories
- Other solutions used by the pupil to present in more detail the selected theme are considered here
In general, the experience working with the pupils can be considered positive; however the results by each specific category were variable and reflected differences on their level of personal motivation and readiness, as it can be seen on Figure 7. Analyzing the statistics represented on this chart, we can infer that:

- The best result was obtained when the pupils chose the colours to be used on the maps: almost 70% of the maps obtained a high or appropriate qualification.
- The worst result was when the pupils selected the symbols to be placed to the maps: in this case, only 46% of the maps were rated as high or appropriate.
- The multimedia information (text, images, data) linked to seven maps (almost 54% of them) can be considered very detailed and varied, completing and illustrating the symbols and areas located by the pupils.

The overall results are shown on Figure 8. Authors wish to remark that the criteria applied during the process of evaluation was very strict, however the pupils participating in the project had no experience making maps and it was the first time when they worked with an web application on a map service. The nine maps qualified as high, appropriate and average can be considered not only works of good quality, but also including personal solutions as the definition of their
own layers to organize better the information, the use of symbols or areas adapted to the specific theme and the linking of multimedia data to the objects on the maps.

**CONCLUSIONS**

Results obtained in the preliminary survey confirmed that pupils know and prefer to use Google map services in their daily life. By this reason authors propose the use of these services in the classroom or for the solution of tasks related to the knowledge acquired in the classroom. Although the process of making an own map using a Google application was unknown by them, the obtained results can be considered appropriate and satisfactory: it re-affirmed that maps of good quality can be made with a proper motivation, instruction and teamwork. Activities related to collaborative cartography are strongly recommended for Secondary Education, they can make a notorious contribution to complete or enrich the themes learned in the classroom and to improve the teamwork. Another factor that must be considered (especially in those schools with limited financial budget) is that it can be used free of charge in any educational institution after further, but relatively easy training of teachers. This research can be considered an introduction to a future, more complex research project on Collaborative Cartography for Elementary and Secondary Schools.

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BIOGRAPHY

Judit Kiss finished her MSc studies on Cartography at Eötvös Loránd University in Budapest, Hungary in 2017. Her research interests lie in School Cartography (focusing on the use of symbols on maps for children, orientation and collaborative cartography in teaching activities), Geoinformatics and Web Cartography. She collaborated in the organization of the last two Barbara Petchenik Competitions in Hungary, as well as in activities related to Cartography that were developed in Hungarian Elementary and Secondary Schools. Her works have been presented in different international events and published in the Geometodika scientific journal in Hungary.

José Jesús Reyes Nunez is Associate Professor at Eötvös Loránd University in Budapest, Hungary. His research interests lie in Cartography for Children (teaching of cartographic concepts and map use in Elementary and Secondary Schools), Digital and GIS Cartography, Web Cartography and Geovisualization. Author of more than 25 articles in scientific publications and more than 65 papers in different events, he has collaborated as cartographer in more than 40 textbooks and atlases. He is responsible for the organization of the Barbara Petchenik Map Competition in Hungary from 1999, being President of the International Jury in 2005 and 2007. He was Chair of the ICA Commission on Cartography and Children from 2007 to 2015, currently Vice-Chair of the same Commission. The International Cartographic Association awarded him with the Diploma for Outstanding Services to ICA in 2015.