ISBN: 978-1-907075-12-4

International Cartographic Association (ICA)

Commission on Cartography and Children

Commission on Maps and Graphics for Blind and Partially Sighted People

JOINT ICA WORKSHOP

CARTOGRAPHY FOR SPECIFIC USERS

Event organized within the activities
previous to the 29th International
Cartographic Conference

Tokyo
2019

Editors: Carla Cristina Reinaldo Gimenes de Sena, Barbara Flaire Jordão and
José Jesús Reyes Nuñez
ISBN 978-1-907075-12-4

ISBN: 978-1-907075-12-4

CONTENTS

Joint ICA Workshop on Cartography for specific users
Tokyo, July 15, 2019
ISBN: 978-1-907075-12-4

International Cartographic Association
Association Cartographique Internationale

Joint ICA Workshop on Cartography for specific users
Tokyo, July 15, 2019
ISBN: 978-1-907075-12-4

Experience School Maps for Partially Impaired Children in Erbil Kurdistan

Ashna Abdulrahman Kareem Zada* / Eötvös Loránd University / Faculty of Informatics Department of Cartography and Geoinformatics/
*ashnakareem88@gmail.com

Abstract: Multimodal communicating maps are a solution for providing the impaired people with access to geographic information. The research create paper maps to set down on a touch display and choosing the best key of maps for representation and displaying on a paper with different forms and colours; according to the samples in the questionnaire; which is the best way to collect data in the Iraqi Kurdistan and Erbil is taken as a sample city for this purpose. The main purpose was to investigate to what extent low vision children reach the advantage of both digital and paper mappings are useful. Also, the study investigates the causes are for non-professionals to use or avoid using this technology and compared with the traditional maps have been used before. The study from all the questions given to the participants showed that there is a good result to using maps by low vision people soon and to be interested into the school curriculum.

Keywords: Maps, GIS, Sightless

1. Introduction

The development of cartography during the twentieth century was occupied by the needs of people. A map is a social document serving many purposes. It is a representation of knowledge, an archival device, a concordance the world and its image. A map is a dream, of the fact that eyes are always travelling. Human mind is also an act of conscious remembering, for there can be no remembering without previous observation that is tried to place and landscapes. Mapping is a technique through which geographical data can be saved. The main purpose is to be familiar with the places. Children can achieve the advantages of this technology as well as gaining the benefits of traditional paper-based maps. Although mapping has many advantages for human beings, many technical and individual problems can appear while using it such as to find the distances and directions of places ...etc. However, it does not mean that all people can get all the advantages from this technology. For example, Blind and Partially Impaired children in Kurdistan Region cannot get benefit from this technology because people do not even know what mapping is. So, there can be many reasons why people avoid using it. Moreover, mapping is frequently not used appropriately by non-professional users in the region. Also, they do not study maps at school and the government dismisses them due to not having appropriate specialists who have knowledge and experience on this theme. For that reason, the research was performed in The Runaki Center (Kurdish for light) which was established in 1990 to serve the blind and visually impaired people in Erbil city and many has been opened recently in Kurdistan region. The Runaki Center is linked with the Ministry of Education for providing school curriculum in both primary and elementary School. The research data was implemented by Geographical Information System (GIS) which ArcMap Desktop are one of the standard tools used in this research. They come in many ways from factual to estimation based and from practical work. In this specific case, it was considered appropriate to use this type of research based on GIS methods, because of necessity to obtain a representative sample. The aim of this research is to investigate the problems that Partially Impaired Children face; regarding using maps at school or outside schools. Also, the research

Joint ICA Workshop on Cartography for specific users
Tokyo, July 15, 2019
ISBN: 978-1-907075-12-4

holds some sample maps that the researcher used a newest technology such as GIS for low vision people to collect and analyses data so that to find the best solutions for them.

In the school built in 1990, two teachers, who taught Geography, confirmed that for low vision and blind students, maps were previously created from rice and beans. They were suggesting to include this same sample to compare the differences between the old technology, and new digital technology. The result from comparing both versions were that students preferred the new modern maps and rejected the old one made by hand as it shows in both Figures 1 and 2. Most of the students were satisfied with the new available technology in their schools for learning and using maps.

Figure 1: Old maps used by pupils

Figure 2: Students excited with the samples

2. Research Method:

The research was achieved by carrying out a questionnaire which was performed in the city of Erbil Runkai, Blind School Center, all students who are partially low vision were participated and it was for both primary and elementary school. In addition to the case study research typically collects a wide array of data from interviews, documents and other sources such as visited institutions and schools in Kurdistan to interview specialists, teachers and pupils.

The total student were around 80 to 120 students according to the data received from the manager of the school. The researcher printed 100 samples from the survey and used all the 100 for both Primary and Secondary school which each of it were consists of 6 grades; in total 12 grades, then the questions divided into two parts: The first part is 36 for the secondary school which consists of (Grade 1, grade 2, grade 3, grade,4, grade 5, grade 6) so it means that students from all grads for the secondary school who are visually impaired. For example, In Grade 1 in the secondary school. The research just found 2 students there, but other grades are more than 5 or more. The studies found that the participants are less which was 36 sample back to me because the number of visually impaired students are less than blind students because of the government that student should take another examination for them in this stage so many students will not pass with this examination so they can't continue with their study and they will not have the chance to blind canter schools. The 2nd parts were 64 students from primary school (grade 1, grade 2, grade 3, grade 4, grade 5, grade 6). In principal 10 students were taken for my survey 5 boys and 5 girls in each grade. Meanwhile, this 10 was not fixed as there was either more or less than 10 low vision students in all grades. Example grade 5 both (boys and girls) were 7. Finally, to calculate the percent's, overall, the research hold 100 students means 100% for primary and secondary school respondents. According to the questionnaires was included 30 different questions into two parts: the first part question was a general question to find out if there are any differences between people regarding age, knowledge about

Joint ICA Workshop on Cartography for specific users
Tokyo, July 15, 2019
ISBN: 978-1-907075-12-4

using mapping etc. The other part questions where all related to using mapping and finding the best solutions to create maps in order to serve the best ways for users who interested in using and understanding the concept of cartography. Afterthought, data were implemented by Geographical Information System (GIS). Advances in GIS methods for analysing these data are improving the quality of studies. The ARC/INFO Map software is the best tool for use and create templates for maps in the completion of this type of research. In this specific case, it was considered appropriate to use this type of research based on GIS methods, because of necessity to obtain a representative sample and indicating powerful tools such as XTools Pro which helps to symphysis all polygons and polylines in order to present maps more clearly for visually impaired people. ET Geo Wizards used to fill polygons and delete gaps between two polygons and two polylines to make maps to be better quality and better understanding as well. After used the simplified and smoothing tools for boundary and lines in ArcMap for all province and rivers aimed to be clear without having any complex between two lines and two polygons. The sample was acceptable and has a good representation because it was not close to each other and recognized very well without any difficulties (Figure 3).

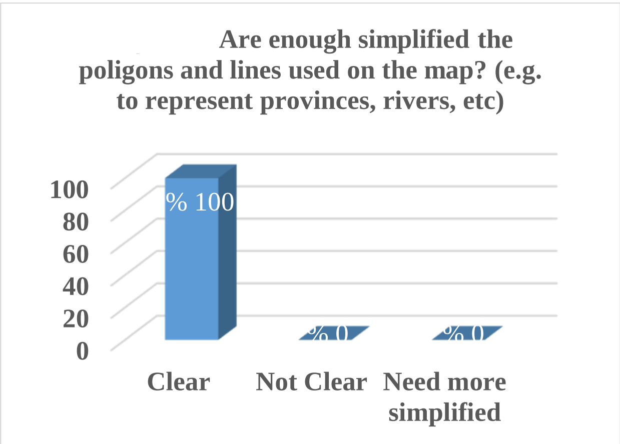


Figure 3

In order to understand how language influences the performance of maps, it is necessary to understand the choosing languages for the representing of paper maps. The favourable language for the low partially sighted is both English and Braille writing system. They prefer English language but also the Braille writing system is acceptable for them to almost the same extent. (Figure 4). After that, swell Braille font installed into ArcGIS. It helped to add the braille writing texts into the map.

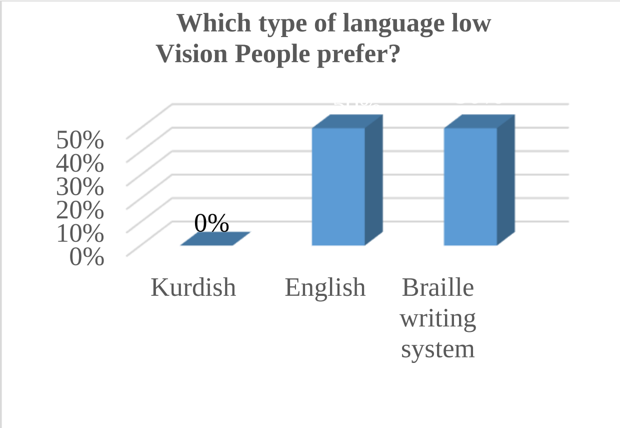
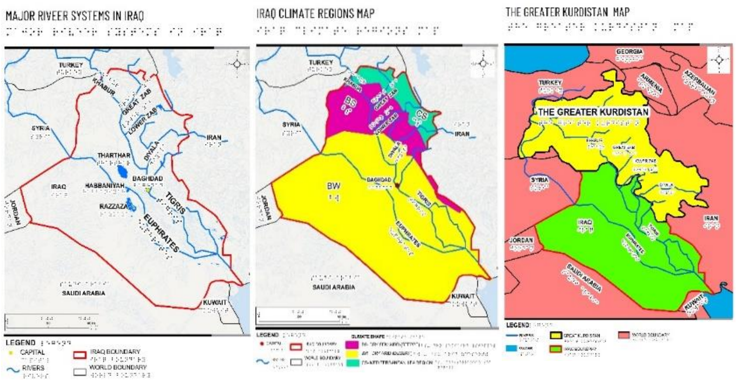


Figure 4

Also, the research was recreated maps from study curriculum according to the primary and secondary research. Then, each of them was shown in templates. Noticeably, templates will be used to get the basic knowledge from primary to secondary schools according to the curriculum. These three examples were taken from 11 template maps which the research presented during the from 11 template maps which the research presented during the survey. Examples are as follows:



Joint ICA Workshop on Cartography for specific users
Tokyo, July 15, 2019
ISBN: 978-1-907075-12-4

Conclusion

Summing up, in this research, a questionnaire was performed to find out how people find using digital and paper mapping successful. The research outputs are as follows:

Despite any graphic limitation that a GIS program can have, their graphic tools are enough to create simplified maps for blind and partially impaired people, in special for children in schools

Despite the difficulties implementing GIS system, it offers number of benefits such as created some templates for impartial people at least have sample to work with it

GIS software offers us other options that can facilitate our work creating these maps (database connection, tools, etc)

Scholars are trying harder to familiarize low vision people with this technology

Future of GIS is very bright because expertise and techniques are already available

Blind people have a serious issue when they move so technological developments can remove or reduce their problems in their life.

The outcome for survey is that all participants hope that these samples will be embedded within their curriculum during their schooling so that they receive the same information as normal students.

Recommendations:

The research made the following recommendations to be taken into consideration as well as to be communicated with responsible from government ministries and school that are authorized to manage the school curriculum with adding maps as a part of study so the below points should be considerable as follows:

1. The government should increase number of staffs to teach the impaired children to use maps at school in order to be familiar with the maps and geographical names and places.

2. Using public media channels and newspapers to increase local community awareness to show the importance of using maps and open a training for who would like to learn using maps.

Joint ICA Workshop on Cartography for specific users
Tokyo, July 15, 2019
ISBN: 978-1-907075-12-4

Simple Symbols for Conveying Experiences and Characteristics about Unique Natural Places

Dr. Stella W. Todd* / Metropolitan State University of Denver
*toddst@msudenver.edu

Abstract. Ecoregions are natural places of unique assemblages of ecosystems, landforms, soils and climate. It is hard for scientists to visualize all of the variables that constitute these unique places and extremely difficult for children and the general public to do so. Yet, as a society we need to have understanding about how each different place is special in order to general interest in their preservation and conservation. Cartographers specialize in showing the unseen geographic relationships that comprise spatial experience. In this project the many qualitative and quantitative properties of ecoregions (vegetation, climate, soils, and landforms) are combined within simplified figurative symbols that can be used within maps or as stand-alone visual icons as mini-experiences of place.

Keywords: Children, Ecoregions, Symbols, Geography, Cartography

1. Introduction

Within the discipline of geography place designation is both a spatial location and an ongoing dynamic event. As we travel from place to place the spatial context changes as the pattern of nature changes. Vegetation, climate, soils, and landforms are interdependent to the extent that they change together over space. Ecoregions (biogeographical regions) are defined as areas of distinct natural landscape patterns. In the United States ecoregions are defined by multiple scientists at multiple spatial scales (Omernik 1987; Bailey 1996). It is difficult to convey these differences within maps as many data layers are involved within each geographic area.

Map symbols simplify information by creating a common visual reference for map cognition. Small symbols may represent both qualitative and quantitative variables. Symbols representing multiple variables involved with mining hazards were standardized by Kostelnick et al. (2008). Standardizing symbols globally intersects different cultures with a common spatial representation that can be quickly and easily interpreted.

The ecoregion concept helps explain geographic differences in landscapes across the globe. Recent efforts producing standardized variables for continents with similar descriptions, measurements, and data formats has made it possible to compare diverse areas more systematically (Sayer et al. 2009). Abstract symbols representing the variation in climate (humidity and temperature), landforms (terrain relief), soil materials (lithology), and ecosystems (dominant plant species) were developed for ecoregions (Todd 2014). Feedback about the symbols presented at the 5th Jubilee International Conference on Cartography & GIS was that they were simple enough to be understood by children.

Maps designed by children are easy to understand and striking in their personal account of places experience. Map symbols that represent true spatial experiences are a desirable characteristic. Achieving a balance between simplicity and perceptual accuracy of place depends on a maps purpose. For this project the purpose was to communicate the beauty, complexity, and uniqueness of natural places for a wide audience. The objective for this project was to create symbols using simplified photographs of actual landforms rather than abstract drawings of landforms in order to generate a more perceptually accurate product for each unique region. Although the landform

Joint ICA Workshop on Cartography for specific users
Tokyo, July 15, 2019
ISBN: 978-1-907075-12-4

symbol elements are slightly more complex than the abstract landforms they record actual experiences within these ecoregions. The expectation was that this set of symbols would intuitively convey differences between ecoregion experiences for a wide audience yet still retain quantitative and qualitative integrity.

2. Methods

2.1 Data acquisition and processing

Data included Colorado ecoregions at two levels (course scale Level III and finer scale Level IV), as well as data layers for climates (isobioclimate), landforms, and ecosystems (Chapman et al. 2006; Sayre et al. 2009) Figure 1. National Atlas Land Use Land Cover (LULC) data along with ecosystems was used to determine dominant vegetation species.

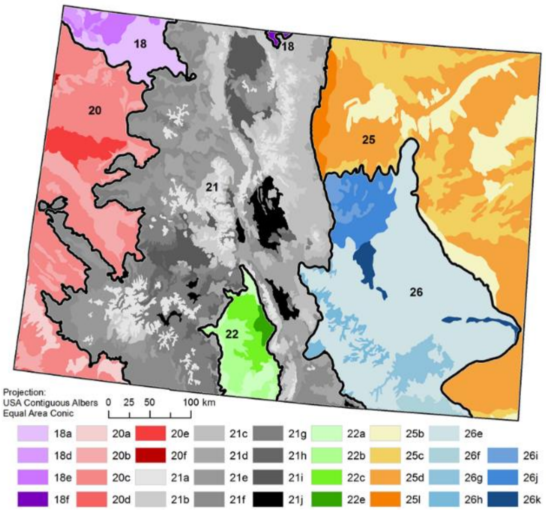


Figure 1: Colorado Biogeographical Regions (Level III and Level IV) Chapman, et al. 2006

Level III Biogeographical Regions: 18:Wyoming Basin, 20:Colorado Plateau, 21:Southern Rockies, 22:Arizona/New Mexico Plateau, 25:High Plains, 26:Southweatern Tablelands; Level IV Biogeographical Regions: 18a:Rolling Sagebrush Steppe, 18b:Foothill Shrublands and Low Mountains, 18e:Salt Desert Shrub Basin, 18f:Laramie Basin, 20a:Monticello-Cortez Uplands, 20b:Shale Deserts and Sedimentary Basins, 20c:Semiarid Benchlands and Canyonlands, 20d:Arid Canyonlands, 20e:Escarpments, 20f:Unita Basin Floor, 21a:Alpine Zone, 21b:Crystalline Subalpine Forests, 21c:Crystalline Mid-Elevation Forests, 21d:Foothills Shrublands, 21e_:Sedimentary Subalpine Forests, 21f:Sedimentary Mid-Elevation Forests, 21g:Volcanic Subalpine Forests, 21h:Volcanic Mid-Elevation Forests, 21i:Sagebrush Parks, 21j:Grassland Parks, 22a:San Luis Shrublands and Hills, 22b:San Luis Alluvial Flats and Wetlands, 22c:Salt Flats, 22e:Sand Dunes and Sand Sheets, 25b:Rolling Sand Plains, 25c:Moderate Relief Plains, 25d_Flat to Rolling Plains, 25l:Front Range Fans, 26e:Piedmont Plains and Tablelands, 26f:Mesa de Maya/Black Mesa, 26g:Purgatorie Hills and Canyons, 26h:Pinyon-Juniper Woodlands and Savannas, 26i:Pine-Oak Woodlands, 26j:Foothill Grasslands, 26k:Sandsheets

Landform photographs were obtained by traveling throughout Colorado and recording visual scenes with various ecoregions. Data was processed to generate statistical values or categories of information for each biophysical variable as specified by Todd 2014, except for the temperature and landform variables that were displayed using different methods. Variation in temperature was conveyed by sun waves and the landforms were derived from simplified landform photographs. Landform representations were scaled within the symbol so that the terrain relief could be determined using a scale along the side of the symbol.

2.2 Symbol development

Narrative descriptions of some climate, ecosystem, and soil properties were available. The ecoregion layer was originally drawn by hand and therefore the GIS layer had little attribute information encoded in the attribute tables about biophysical properties. We assumed that the finer-resolved physical datasets of Sayre et al. 2009 would sufficiently characterize the physical variation for Level IV ecoregions in lieu of spatial GIS data values specific to the ecoregions. Quantitative values were based on an appropriate statistical measures for each variable for each ecoregion.

To test the assumption that the biophysical variables of temperature, precipitation, and terrain relief described by Chapman et al. (2006)

Joint ICA Workshop on Cartography for specific users
Tokyo, July 15, 2019
ISBN: 978-1-907075-12-4

were compatible with the generalized ecosystem variables of temperature, precipitation, humidity, and terrain relief of Sayre, et al. (2009) a correlation between both sets of values was conducted for the 35 biogeographical regions. Because the stated values of Chapman, et al. (2006) for the biogeographical regions compared reasonably well to the generalized values of Sayre, et al. (2009) their use was justified. For example the Max July Mean Temperature (oF) from Chapman et al. (2006) and Minimum Positive Temperature (Tp) from Sayre, et al. (2009) were strongly and positively correlated (r = 0.96413, Pr > r 0.0359). Similarly the Max Precipitation (in) from Chapman et al. (2006) and Minimum Ombrothermic (Io) humidity values from Sayre, et al. (2009) were positively correlated(r = 0.94695, Pr > r <0.0001). Local Relief (M) was positively correlated with Average Terrain Relief (M) (r = 0.84603, Pr > r <0.0001). Symbols were designed in Adobe Illustrator for each of 35 Level IV ecoregions.

3. Results

3.1 Physical Property Distinctions

The variation within Colorado climate datasets included all of the world-wide humidity classes excepting ultrahyperarid, hyperarid, and arid. The positive temperature classes were also quite variable, with not all global classes represented. Colorado was representative of a variety of humidity classes from semi-arid to ultrahyperhumid. Similarly, positive temperature was quite variable for Colorado ecosystems similar to the global temperature variation (Rivas-Martinez & Rivas y Sáenz 2009).

The array of data values associated with the set of physical variables for each ecoregion was unique. Distinctions between biogeographical regions were visually evident for the Colorado Plateau, the Wyoming Basin, the Southern Rockies, Arizona/New Mexico Plateau, High Plains, and Southwestern Tablelands ecoregions. Seven of the 10 ecoregions in the Southern Rockies had average terrain relief above 100m. The Escarpments region (20e) also had a high terrain relief relative to other Level IV regions in the Colorado Plateau although low hills and rolling landscapes were common features. The Shrublands and Low Mountains region (18d) within the Wyoming Basin had an average terrain relief of 94m which was similar to the 93m terrain relief of the Semiarid Benchlands and Canyonlands (20c) region within the Colorado Plateau. For all 35 ecoregions the most prevalent lithology class occupied at least 50% of the area. Most of Colorado was relatively dry excepting some of the ecoregions with moderate to high terrain relief. Within each region the average area occupied by a single humidity category (of six possible categories) was 79%. Positive temperature was not always paired with low humidity as evident in the grassland parks (ecoregions 21i and 21j). Within all 35 ecoregions a single temperature category (of eight possible temperature categories) occupied at least 39% of the ecoregion area.

3.2 Ecosystem and Land Cover Distinctions

Most Level IV biogeographical regions were dominated by three or fewer ecosystems, with over 72% average area coverage by the three most prevalent ecosystems. Within the Wyoming Basin (ecoregion 18) shrublands and grassland are predominant. The Colorado Plateau (ecoregion 20) consists of a mixture of shrublands and mixed conifer forest. At higher elevations in the Southern Rockies (ecoregion 21) forest, grassland, and shrublands were present at varying elevations. The Arizona/New Mexico Plateau (ecoregion 22) contained shrublands, grasslands, and croplands. The High Plains (ecoregion 25) was mostly grasslands with some croplands as well. Grassland were prevalent in the Southwestern Tablelands (ecoregion 26) as well, with some Pine-Oak woodlands as well.

The three representative species were selected from ecosystem and land cover databases for the symbols. Sagebrush species were particularly pervasive. Deciduous tree species were seldom representative. Most selected species were representative for more than one Level IV

ISBN: 978-1-907075-12-4

region. While individual species of grass were sometimes described as dominant or prominent they were designated as grassland (mixture of types), shortgrass, or tallgrass types due to the difficultly in identifying particular species.
The set of symbols for the thirty-five Colorado Level IV ecoregions is shown in Figure 2.

Conclusion

Cartographic generalization of map features is a common practice of map production. But the generalization of symbol elements to create a multivariate symbol is not routine. The multivariate symbol allows for scene construction that emulates actual geographic experiences. With the ever-increasing data availability it is more important than ever to develop techniques to visualize different types of data together within a single symbol for a single map. Symbols containing multiple variables may be an optimal approach for this purpose as they can contain complex scientific data but they do not need to be overly complex visually. These types of pictorial groupings may be of particular use to children and other non-technical individuals in order to convey the complexity of a scene in a straight-forward intuitive way not unlike personal experience.

References

Bailey, R.G. (1996) Ecosystem Geography: Springer-Verlag New York.

Chapman, S.S., Griffith, G.E., Omernik, J.M., Price, A.B., Freeouf, J., Schrupp, K.L. (2006) Ecoregions of Colorado (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1: 1,200,000).

Kostelnick, J. C., Dobson, J. E., Egbert, S. L., Dunbar, M. D. (2008) Cartographic Symbols for Humanitarian Demining, The Cartographic Journal, 45 (1), 18-31.

Omernick, J.M. (1987) Ecoregions of the conterminous United States, Annals of the Association of Geographers, 77 (1), 118-125.

Rivas-Martinez, S., Rivas y Sáenz, S. (2009) Synoptical Worldwide Bioclimate Classification System (summarized table): Centro de Investigaciones Fitosociologicas. http://www.globalbioclimatics.org/book/namerica2/table.htm.

Sayre, R., Comer, P., Warner, H., Cress, J. (2009) A new map of standardized terrestrial ecosystems of the conterminous United States: U.S. Geological Survey Professional Paper 1768, 17 pgs.

Todd, S.W. (2014) Cartographic Symbols Depicting Ecoregion Properties, in Thematic Cartography for the Society, Lecture Notes in Geoinformation and Cartography, Springer International Publishing, Switzerland

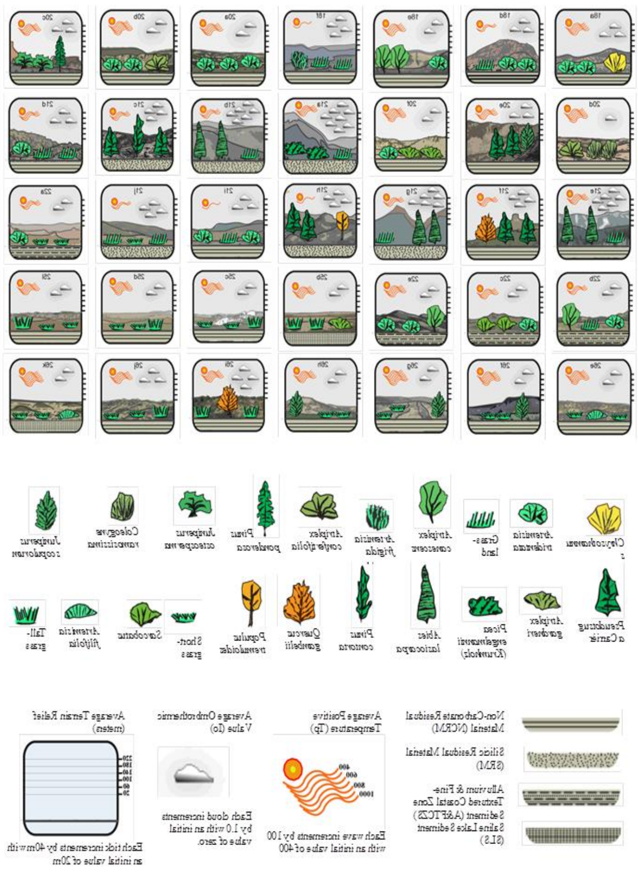


Figure 2. Cartographic symbols for Colorado ecoregions with legends for each element based on Chapman et al., (2006), Sayre, R., Comer, P., Warner, H., Cress, J. (2009), Todd (2014), and the 2001 National Atlas (http://nationalatlas.gov).

Joint ICA Workshop on Cartography for specific users
Tokyo, July 15, 2019
ISBN: 978-1-907075-12-4

Cartography, Technology and Interactivity: Possibilities in the Process of Learning to Learn Geography

Tiago Salge Araujo*, Paula Cristiane Strina Juliasz**
*tiago.salge@redeicm.org.br; **paulacsj@id.uff.br

Abstract. The use of technologies (analog and digital) in the work with cartography in basic education is the central object of debate of this article. We share the view that neotechnology is both the starting and arrival of school cartography. Throughout the activities presented here, technologies have been instrumental in the process of learning to learn geography in an autonomous, interactive and more pleasant way. This article focuses on didactic sequences using both analog and digital technologies available in an interactive room of a private school in the countryside of the state of Sao Paulo. In this paper, besides presenting our conceptions and options within school cartography, we seek to explain what we mean by interactivity and autonomy. Finally, we hope that this work contributes to the emergence of new possibilities and that the cartographic practices in the school can be increasingly the result of a collective and collaborative process.

Keywords: Cartography, Technology, Interactivity and Autonomy

1. Introduction

The presence of digital technologies in the school space is an unavoidable reality; either through the laboratories and devices installed in it, or through the massive use of smartphones by students and teachers. Transiting between concrete space and cyberspace, however, is not a task exempt from uncertainty and questioning if it is in a school culture marked by traditional and imperative models and practices.

In the teaching of geography, and especially when cartography is developed as a language, digital technologies and the Internet represent an increasingly fertile territory with ever more dilute boundaries. More than mere static visualization, today, cyberspace and its tools enable real active participation, interactivity and collective construction of knowledge. This cartography, based on digital technologies, has been called neocartography, which "is characterized by involving the production and access to cartographic documents through digital devices such as internet browsers, mobile devices, among others." (Freitas 2014, p.31).

In this paper, we will present some practices and possibilities that were woven throughout the Geography classes with classes from the 6th grade of Elementary Education II - EF II, under the responsibility of one of the the authors of this article. The practices described here have been developed over the last three years, within the different themes of cartography, and aimed at using both analog and digital technologies.

Canto (2010) states that "at the root of the cartographic practices carried out through these new systems is one of the main processes that have defined the digital culture: the remixing", because this type of activity depends on a specific technology environment that allows the restructuring of elements, that is, there is a permanent dialogue between the innovation and the cartography already existing in the daily life of the subjects. In this sense, there is a remix between these ways of knowing and representing space and learning more about the reality in it.

This article also reserves special attention to our understanding of interactivity, autonomy and

Joint ICA Workshop on Cartography for specific users
Tokyo, July 15, 2019
ISBN: 978-1-907075-12-4

what we understand about learning as a conscious act. Although our objective is not a debate about these concepts, in general, we will support here the idea that the technologies (digital or analog) are precisely the tools that enable such characteristics. The interactivity occurs spontaneously and collaboratively as technologies foster an environment of autonomy and creativity in the way of learning to learn Geography.

Finally, we argue that technologies alone do not define all the didactics inherent to the teaching activity in the classroom; it will always be up to the teacher to research, make methodological options and define how and in what moments to use technologies in a meaningful way so students can develop ways of thinking the space in the light of Geography. As highlighted by Oliveira (2010), no cartographic activity should ever be given when they are already fully ready and developed in books, atlases or manuals. On the contrary, they must always be elaborated by the teacher through techniques that challenge the students; after all, the student's action on the object of knowledge is the most important stage on its construction.

2. Methodology

Although the content of cartography in the 6th grade of Elementary School has special emphasis in the first two of three months of Geography classes, and students during previous school years had already established contact with the cartography and went through the cartographic initiation1, we defend that the teaching of cartographic language is inseparable from the teaching of geography at all school stages. We emphasize that the Geography class should not be understood as a Cartography class, but it is necessary that the students learn fundamentals and basic elements about the map in a contextualized way.

In the 6th grade, together with the specialist teacher, students will be confronted with geographic coordinates, cartographic scale calculations, types of cartographic projections, and the functions and applicabilities of cartographic technologies such as compass and GPS. When it comes to Cartography in Geography teaching, Simielli (2007) proposes levels to be considered at the time of its use in Elementary School: localization and analysis, correlation and synthesis. For this author, although the cartographic literacy is developed with students from the 1st to the 5th year, it can be extended into the 7th year, but from the 6th year (between the 6th and 9th year) it becomes possible to work with the analysis, location and correlation. Critically, with support of maps already elaborated, the student not only locates and analyzes certain phenomenon in the map, but also establishes relations between the various mapped data.

The above-mentioned topics require special treatment and approaches that can meet the needs and aspirations of the students. How to teach cartography without making use of the digital reality that imposes itself to most of us? If students use digital technology more and more often through their smartphones (sending location and use of GPS, for example), wouldn't it be easier and make more sense to start from here?

Here we will describe some of our practices without, however, aiming to indicate only one path. We know that the realities of different regions and schools in Brazil are extremely different, but we also believe that the use of technologies (analog or digital) should not be restricted to the resources available in the school. It takes sensitivity and creativity to transform what is "in the student's pocket" (cell phones and smartphones) into a didactic tool.

Also, we do not intend to indicate indisputable practices, disconnected with the whole process of teaching geography, let alone define only a

[1] Process described and also known as cartographic literacy. See more in ALMEIDA R D; PASSINI E Y (1994) O espaço geográfico: ensino e representação. São Paulo, Contexto.

ISBN: 978-1-907075-12-4

few moments for the work with cartography. On the contrary, we are convinced that all the codes of cartography and "maps should be part of everyday school life and not just be included in the specific days of geography," a type of non-formal text that needs to be contemplated and disseminated in the contemporary world, seeking to articulate theory with practice. Castrogiovanni (2003, p. 31).

The practices that we will present, much more than operations and techniques to be internalized, were developed in accordance with Almeida's (2007, p.174) arguments when the author stresses that "(in) the teaching of Geography, the graphic language must be included alongside other non-verbal languages, in the roll of tools that enable world readings. "

2.1. Remote sensing: from the stereoscope to the *Ipad*

The National Curricular Parameters (PCNs) of Geography highlight the urgency of using new technologies in educational practice. In this way, the aerial photographs and satellite images allow the development of a type of point of view that is not part of the students' daily life: the vertical perspective, so that they can understand their uses as well as the diverse elements of an area, and its dimensions.

The practices took place at an interactive classroom where there are available forty iPads, image projection devices, a green painted wall for video recording and editing (technique Chroma Key). The conventional chairs and lined tables gave space for puffs and sofas.

In order to discuss and manipulate remote sensing products, we started with an expositive class in which some techniques and applicability of the devices were presented. In the following class the students experimented with aerophotogrammetry: pairs of images from the Rio Claro region and stereoscopes[2] were distributed to the students and they were instructed to recognize the elements and characteristics of the areas represented in the aerial photographs.

In this activity the students were very excited to be able to handle an equipment that although old (analog technology), allows such a "real" visualization of the geographic space. We noticed that some students found it more difficult to see in stereoscopy and this was sometimes met with frustration. When we were asked about the applicability of this technique in the professional field, we emphasized the importance of knowing and mastering how to use battery-free technologies (digital technology), as this ends up conferring greater autonomy and safety when professionals are in the field and need to develop work.

If we had more time to extend our activities, we thought that the creation of land use maps, based on the provided aerial photographs, could be an interesting development for this practice. Without stereoscopes, the teacher could propose the elaboration of this type of map, already exploring all its elements: title, legend, scale and colors.

Figures 1 and 2: Students practicing aerophotogramme-try with stereoscopes.

Following with the theme of remote sensing, we proposed an activity in the interactive room. In order to better conduct classes in this environment, and to make it a true interactive environment, the schools has developed a

[2] Material organized and kindly provided by the laboratory of the Department of Territorial Planning and Geoprocessing of UNESP campus of Rio Claro.

Joint ICA Workshop on Cartography for specific users
Tokyo, July 15, 2019
ISBN: 978-1-907075-12-4

partnership with the Mosyle Shared3platform, a teaching platform available for iPads that enables teachers to offer and manage activities, as well as closely follow what each student is creating. All students have a code and, at the end of each activity, the student sends it to the teacher's digital folder so the teacher can interact with what was created/produced.

At this point, it becomes evident the interactivity that such environments make possible. According to Silva (2001):

> Interactivity is a concept of communication and not of information technology. It can be used to define communication between human interlocutors, between humans and machines, and between user and service. However, in order to have interactivity it is necessary to guarantee two basic dispositions: 1. The dialogic that associates emission and reception as antagonistic and complementary poles in the co-creation of communication; 2. The intervention of the user or receiver in the content of the message or the program open to manipulations and modifications. (Silva 2001, p.5).

After exploring the EarthViewer application4, students were asked to use Google Earth to answer some of the questions we had proposed (Figure 3). We also took this opportunity to introduce some notions of geographical coordinates. Students should first find their homes on Google Earth, then find and explore a city indicated by the teacher, and finally find out which places represented each of the geographic coordinates that had been given to them. The responses of this last stage of the activity were sent by the Mosyle platform to the teacher's folder so he could check and interact with each student's answers. To this activity we gave the name of "Around the world with the cartography".

We believe that with such activities, the teacher is proposing the knowledge and ways of knowing the fundamentals of the geographical coordinates so that they could establish comparative relations between the different places proposed by the teacher. Students can develop the conscious act of learning because they had not been imposed concepts or forced to simply memorize coordinates. Instead, they have their critical thinking stimulated and begin to answer questions concerning locations of different places and their connections, which allows them to develop concepts and ideas within a locational system.

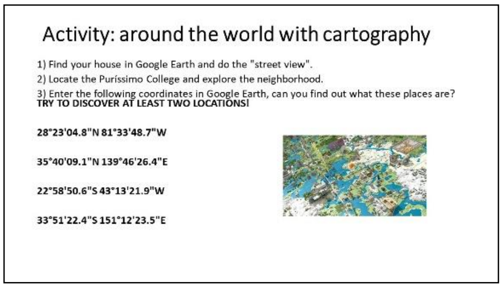


Figure 3. Activity proposed to students in the interactive classroom.

Figures 4 and 5. Students performing the activity in the multi-room

2.2. Orientation in geographic space: between the needle and the touch screen

The work and the orientation in the geographical space can be done in different ways: building of sundials, games, observation of the apparent movement of the sun and other stars, construction of wind roses and also by using the compass and GPS (Global Positioning System).

[3] https://mosyle.com/shared

[4] EarthViewer allows you to view the continents as you go through the geological time slave. With additional layers you can explore changes in atmospheric composition, temperature, biodiversity, daytime and solar luminosity over geological time and also observe the locations through geographic coordinates.

ISBN: 978-1-907075-12-4

The practice of orientation is of central importance in the teaching of geography "since we are working with dimensions of space and time, which are fundamental for the movement of the student in his daily life ..." (Fonsêca, 2004, p.64). The same author says that:

> Geographical orientation as an abstract subject and difficult to incorporate on the part of the students, but necessary in the school routine, requires a constant re-reading on the subject, and it will be up to the teacher within his school planning to define the ideal moment and suitable to work on this issue. (Fonsêca, 2004, P.65)

In the first two classes on this subject, we chose to talk and present some questions regarding the apparent movement of the Sun and the rotation movement of the Earth, then we elaborated a wind rose with the cardinal points, their collateral and circular sub-divisions. In the following two classes, we discuss the technical and practical aspects of the compass: its origin, its functioning, its parts and its applicability.

Following these activities, in the schoolyard, we provided a visa compass (with azimuths) for each student. In doubles, students should set the azimuths of collectively predetermined points. In addition to the azimuths (values in degrees) the students were also asked to mark to which collateral or cardinal point the respective azimuth corresponded to - our goal was to help them to better absorb knowledge.

Figures 6 and 7: Students in the yard scoring the orientation and azimuths of college points.

On the gradation of the chosen compass (in azimuths) we should clarify that according to Uzêda (1963: 125), the azimuth "is the angle formed by this direction and that of the magnetic north signaled by the magnetized needle, and whose angle is always read clockwise." That is, azimuths are magnetic directions ranging from 0º to 360º degrees clockwise (where the north is 0º or 360º, the east is 90º, the south the 180º and the west the 270º).

In the following classes we continued with the orientation activity, but in the interactive classroom. As with the previous activities in this same room, this one was also available to each student in the Mosyle environment/platform. The activity consisted in marking the azimuths and cardinal and collateral points in the sketch of the interactive room and indicating the objects located in other points (azimuths) indicated in the activity (figure 9). The application we used was Compass ++ (image 8), which besides magnetic north (and azimuths) also points the geographic north and allows the user to change and choose the layout of the compass.

Figure 8: Compass ++ application used in this activity.

We agree with Fonsêca when he argues that although most of the researched referents emphasize cartographic initiation from the drawing up of maps and the fact that we become a reader only after acquiring the consciousness of representation, "[...] for us the important thing is for the learner to develop the capacity of communication and observation [...] as well as the reading ability that allows this pupil the perception and spatial domain". (2004, p.71).

Joint ICA Workshop on Cartography for specific users
Tokyo, July 15, 2019
ISBN: 978-1-907075-12-4

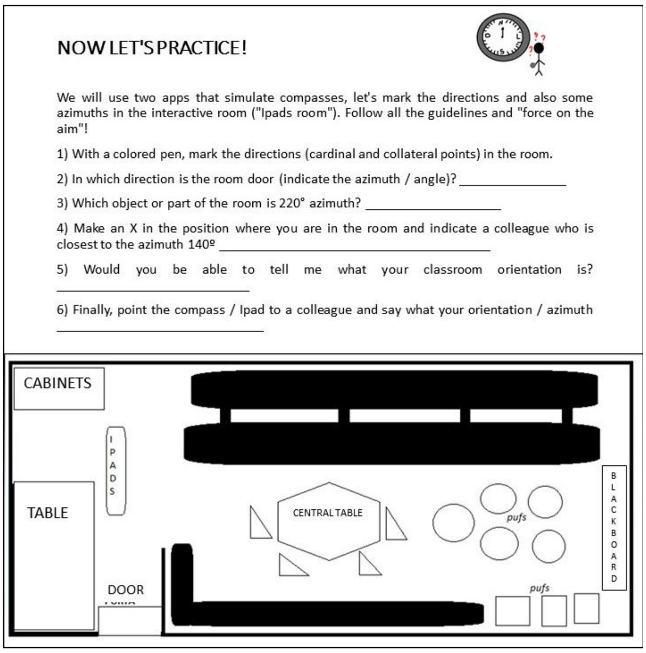


Figure 9: Activity proposed to the students in the interactive classroom.

As the title of this work reports, we seek in all activities to establish close boundaries between cartography, technology and autonomy. We think that orientation activities (with the analogue or digital compass) contribute significantly to the development of students' autonomy, learning and learning how to move in space. Confirming this perspective, Pacheco's Values Dictionary (2012, p.10) says that "autonomy is a concept with a vast semantic aspect and with many appendices: self-esteem, self-confidence, self-control, self-discipline". After all, knowing how to orientate oneself in the geographic space does bring a "gain in autonomy", doesn't it?

3. Concluding Notes

Taking into consideration the whole process that involved the activities presented; the research, the choice of materials and the practice with the students, we can articulate some concluding notes based on our theoretical understandings about the learning of Geography through Cartography and the use of technology . The centrality of cartography in the teaching of geography, the relationship between neocartography and autonomy, and the nuances of interactivity in the path of conscious learning of how to develop knowledge within a subject matter would be the three points worth highlighting.

Although the practices took place during the first academic quarter, in which the cartography appears as central subject in the didactic book adopted by the school; we believe that it should not be studied as an isolated subject matter. Cartography must permeate all the geography content developed throughout the year; we must teach the map and through the map. Cartography is the language of geography that actually enables spatialization of phenomena, interpretation, and the establishment of connections between each other.

Analyzing reality from a geographical perspective requires the use of cartographic language, as reality does not consist and is not limited to the near and experienced space. After all, it is Geography, as a school discipline, endowed with its logical concepts and principles (location, extension, distribution, scale, arrangement, configuration, network) that allows to make relationships about locations, conditions and connections between places.

By dealing with the relationships existing on the land surface and in the school, Geography allows the students to begin to understand them so that they can form critical analysis on the use and occupation of the soil, the terrestrial dynamics and the territorialities and the cultures. Students can begin questioning about the forces and influences that define a place, and the relationships between elements of the physical environment and society.

Knowing the geographic coordinates allows the student to make relationships, for example, between the different locations in the same latitude so that they can make comparisons in relation to the climate, which demands the mobilization of the principles of location,

ISBN: 978-1-907075-12-4

distribution and extension. Knowing how to orient yourself with instruments such as the compass is also to become aware of the human need to create instruments to dominate and occupy space, so that it constructs notions of distance and direction.

By developing the notion of topography in an interactive way as with the sand box, the arrangement principle is mobilized so that children can analyze how a particular landscape behaves when there is a certain topography, which open ways for them to think critically and create hypotheses regarding human occupation and space organization with such configuration. For analysis of factors that escape the immediate experience of the subjects to cartography becomes extremely important, because it works with reality and with the representations about it.

With regards to neocartography and autonomy, it was evident to us that technologies, besides allowing a broader interactivity (between student-students, teacher-students, technology-students-teacher), also open innovative paths for the emergence of an autonomous construction of knowledge. This means that the student, through technologies and their interactivity tools and possibilities, will learn how to manipulate and construct knowledge. He is not merely a spectator, but a creator of knowledge. Although Calvino (1984) has already pointed that the geographical chart, although static, presupposes a narrative idea, we think that neocartography (far from being static) contributes even more to new narratives, new knowledge and new practices in school activities and pedagogical plans.

Finally, when it comes to learning to learn geography, we are convinced that this process must be developed and stimulated by the teacher through a conscious and intentional exercise aimed at developing the geographic knowledge for a better analysis of reality. In the case of cartography, as students learn to decode it, a world of possibilities and ways of doing school geography opens up. Considering that knowing how to move in space safely and independently is one of the greatest gains in the autonomy of the human being, we believe that the learning acquired by the students during these activities was highly significant and relevant.

References

Almeida R D. (2007) Cartografia escolar. São Paulo, Contexto.

Almeida R D, Passini E Y. (1994) O espaço geográfico: ensino e representação. São Paulo, Contexto.

Calvino, Í. (1984) “Il viandante nella mappa. In Collezione di sabbia. Milão, Garzanti p.23-24.

Canto T S, Almeida R D. (2011) Mapas feitos por não cartógrafos e a prática cartográfica no ciberespaço. In: Almeida R D. Novos rumos da cartografia escolar: currículo, linguagem e tecnologia. p. 147 – 162.

Castrogiovanni A. C. (2003) O Misterioso mundo que os mapas escondem, In: Castrogiovanni A C. Geografia em sala de aula: práticas e reflexões. Porto Alegre, UFRGS, p. 31-47.

Fonsêca A V L. (2004) Orientação geográfica: uma proposta metodológica para o ensino de geografia na 5ª série. 2004. 145 f. Dissertação (Mestrado) – Centro de Ciências Humanas Letras e Artes, Universidade Federal do Rio Grande do Norte, Natal.

Freitas M I C. (2014) Da Cartografia Analógica à Neocartografia: Nossos mapas nunca mais serão os mesmos? Revista do Departamento de Geografia , v. 1, p. 23-39.

Oliveira L. (2007) O estudo metodológico e cognitivo do mapa. In: Almeida R D. Cartografia Escolar. São Paulo, Contexto.

Pacheco J. (2012) Dicionário de valores. São Paulo, Edições SM.

Silva M. (2001) Sala de aula interativa a educação presencial e à distância em sintonia com a era digital e com a cidadania. Anais do XXIV Congresso Brasileiro da Comunicação – Campo Grande /MS – setembro.

Simielli M E R. (2007) Cartografia no ensino fundamental e médio. In: Carlos A F A. A Geografia na sala de aula. São Paulo, Contexto.

Uzêda O G. (1963) Topografia. Rio de Janeiro, Ao livro técnico.

Joint ICA Workshop on Cartography for specific users
Tokyo, July 15, 2019
ISBN: 978-1-907075-12-4

The Use of Maps and Cartographic Material in Non Formal Education for Children and/or Adults in hospitality centers

M. Pazarli*, N. Ploutoglou**, K. Staikou***, E. Daniil****
* [pazarli@maplibrary.gr; ** [ploutoglou@maplibrary.gr]; **** [daniil@maplibrary.gr]

Abstract: Since 2015, the refugee / migrant crisis in Mediterranean area has been a major concern of the European geospace. Among the various critical issues, apart from the economic, political or historical aspect of this major humanistic crisis, is the management of refugee / migrant flows on an educational and pedagogical level. The Regional Directorate of Primary and Secondary Education of Central Macedonia coordinated the Erasmus Plus KA2 programme "Managing the Refugee and Migrant Flows through the Development of Educational and Vocational Frames for Children and Adults – XENIOS ZEUS" (2016-18), concerning the ways the implicated agents in Greece, Italy and France were dealing with the refugee / migration flows on an educational and pedagogical level and the exchange of good practices. The General State Archives of Greece-Historical Archives of Macedonia-Cartographic Heritage Archives offered the training project "The Use of Maps and Cartographic Material in Out of School Education for Children and/or Adults in hospitality centers", addressed to teachers, educators, researchers, volunteers, and other interested persons or institutions, taking action in non-formal educational programmes for children and adults refugees / migrants inside the hospitality centers. This project refers to the Cartographic Heritage Archives training project, the educational purposes, its structure and implementation, as well as to the gained experience from the implementation of the programme.

Keywords: Cartography, Map, Refugee/Migrant Flows, Educational Programmes for Refugees, Maps and Education, Maps and Children

Joint ICA Workshop on Cartography for specific users
Tokyo, July 15, 2019
ISBN: 978-1-907075-12-4

Development of an online learning environment for geography and geology using Minecraft

Junko Iwahashi *, Yoshiharu Nishioka**, Daisaku Kawabata***, Akinobu Ando****, Hiroshi Une*****
*iwahashi-j96pz@mlit.go.jp;**y-nishioka@aist.go.jp;***kawabata@aist.go.jp;****andy@staff.miyakyo-u.ac.jp;
*****hiroune@mb.infoweb.ne.jp

Abstract: The purpose of this research is to give children a geographical viewpoint, and to encourage an interest in, and awareness of, landforms and geology. We created a system based on an exploration type computer game and verified the educational effects. Moreover, we aim to reach not only the virtual aspect but we also have a goal of creating interest in the actual field. As a secondary effect, by using a computer game that attracts children's interest, we aim to make the experience of solving issues subjective and active even if the player is a passive child, a child with little inquiry, or a child who is not adept at self-assertion. With this new approach, we also hope to interact with young generations who usually do not interact with researchers. Many thematic maps of geography and geology are already published on the Web. They are popular among those who need to collect and view the information for some reason or with those who are interested in observing topographic maps and are interested in geology. However, in particular, the approach to children who do not have such motivation needs one more step: a mechanism to induce an inquiring mind, and a mechanism that leads to finding the information and having interest in the real field. The platform of this research is Minecraft Education Edition (Mojang/Microsoft). Minecraft is very popular game software, which has exceeded one hundred million users worldwide in recent years, and in Japan there are many elementary and junior high school student enthusiasts of Minecraft. In the game a user explores a virtual world made of cubic blocks. The blocks imitate vegetation, rock formations, and other items, and can create various puzzles. In recent years, the release of the Education Edition assumes use in classrooms. In this research, we have constructed a virtual world tailored to a specific junior high school, which teaches science classes to first grade students. First, we re-created the actual school buildings and included the underground geologic strata based on data from boring. In addition, we created a mechanism to expand children's imagination and knowledge about past environments, which can be understood from the geological strata. We also provided checkpoints and gave challenges regarding knowledge about the formation of the land. Together with this modern world, we created ancient virtual worlds so users may understand the geological history around the school's location. Through the experience of this research, we were able to confirm the mechanisms for promoting motivation in children and aiding their understanding of science. It can be applied to systems other than Minecraft, and it can contribute to educational support in a wide variety of fields.

Keywords: Minecraft, Computer game, Education, Geography, Geology, Sendai.

Joint ICA Workshop on Cartography for specific users
Tokyo, July 15, 2019
ISBN: 978-1-907075-12-4

QR Code: a technological resource to dynamize teaching

Diego Alves Ribeiro*, Carla Cristina Reinaldo Gimenes de Sena**
*alves.ribeiro@unesp.br; **carla.sena@unesp.br

Abstract: We live in a digital age, where technological advances dictate how the world is perceived, thus making the use of technology in our daily lives becomes inevitable, with cellphone being one of the most common devices, especially with students inside the classroom. As new machines, devices and programs appear on the market and with the diffusion of their use, the way of living their users undergoes great transformations in a continuous way. New forms of access to information originate, to relate, to see, to behave, to learn, to work, to have fun and to think. (SANTOMÉ, 2013). We are then faced with a choice, to use these tools as a positive thing in classrooms or to be stuck in a model of teaching that no longer corresponds completely with the reality of our students. It is extremely necessary to be constantly updating ourselves, as educators and as members in a technology-driven society, creating more and more means for the emancipation of the subject in society through education. Santomé (2013) states that teachers and students can learn the possibilities of these resources by working with them through active and reflexive didactic methodologies and with much better use if some form of research-based learning is employed. In order to make educational resources (such as maps and models), and consequently teaching practices linked to them, more dynamic, we have the implementation of the Quick Response Code also known as QR Code, created in 1994 in Japan by the company DensoWave, a new type of code with the objective of being read quickly by a reading equipment, being a substitute of the old bar codes in black and white (DENSO, 2019). It allows the storage of different types of data, including alphabetic characters, numerals, symbols, binaries and even Kanji and Kana (Japanese alphabet), in addition to being an open source, that is, anyone can generate and use it freely and without any cost. We seek to explore how QR Codes can be used as a way of dynamizing didactic resources for its easy implementation, low cost and high versatility. Nowadays the information can be easily read through a QR reader installed on a tablet or smartphone. Once scanned, the code can redirect the user to a link, a website, a text or image, leading a user to specific content, advertising campaigns, coupons, offers, among other possibilities. For example, in 2018, the city of São Paulo inaugurated the "Cidade Que Fala" project, installing QR Codes in 21 statues and monuments of the city, which provide, free of charge, content about the lives of characters portrayed in the works, to stories of monuments and buildings, which are interpreted by actors and actresses who describe the city's rich history bit by bit (Som/ SA, 2018).

A dynamic legend with such resources becomes an important pedagogical tool, even more so if we consider resources adapted for the visually impaired, since the audio description makes the content more didactic for the student with a disability. By linking the codes to multimedia sites on the Internet, it is possible to provide a very efficient and flexible way for students to obtain information more quickly and dynamically (LAW; SO, 2010). We believe that the possibility of using QR Codes in the teaching and learning process in this way is almost unlimited.

Keywords: Quick Response Code, Interactive legend, Didactic resource.

References

Denso. Denso Wave Incorporated. Available at: http://www.denso-wave.com/en/index.html. Accessed 18 April 2019;

Law, Ching-yin; So, Simon. QR Codes in Education. Journal of Educational Technology Development and Exchange, 3(1), 85-100. Available at: http://aquila.usm.edu/jetde/vol3/iss1/7. Accessed 18 April 2019

Santomé, Torres. Currículo escolar e justiça social: O cavalo de Tróia da educação. Porto Alegre: Penso, 2013. P. 9-44

Joint ICA Workshop on Cartography for specific users
Tokyo, July 15, 2019
ISBN: 978-1-907075-12-4

Som/SA, Projeto “Cidade que Fala”. Available at: < https://somsa.com.br/qrcode-cidade-que-fala/>. Accessed 18 April 2019;

Interactive 3D printed haptic maps - TouchIt3D

Jan Brus*, Radek Barvir, Alena Vondrakova
* jan.brus@upol.cz

Abstract: In practice, there are many technologies used for creating tactile maps nowadays. These techniques involve very primitive and cheap solutions as well as advanced methods. One of the possibilities how to produce a haptic map can be by the technology of 3D printing (Voženílek et al., 2009). Maps made by 3D printing process can be divided into several types. The simplest ones use only one color and portray the spatial information by 3D shapes. More sophisticated ones can combine several colors. Braille font can also be implemented (Kieninger & Kuhn, 1994). Nevertheless, the complexity of such a map can be very high. Also, the user understanding can be affected by the mentioned complexity (Barvir, Vondrakova, & Ruzickova, 2018; Zeng & Weber, 2011). Mainly due to this problem at the Department of Geoinformatics, Faculty of Science, Palacký University Olomouc, Czechia, the research team developed prototypes and methodology for the creation of the modern type of 3D tactile maps, linkable with mobile devices (Tekli, Issa, & Chbeir, 2018). Interactive tactile maps connectable with mobile devices bring new opportunities to develop tactile map production. This unique technology was developed by optimization of 3D printing models connected with a specially designed mobile application. These maps allow full user optimization including language or content changing by modification the application not the 3D printed map. The prototypes have been verified in practice in cooperation with educational centers for people with visual impairment and blind people, and special schools. This technology covers comprehensive research focusing on many scientific challenges. The contribution summaries the most significant findings of the research and present the developed technology TouchIt3D. This research is implemented within the project Development of independent movement through tactile-auditory aids, Nr. TL01000507, supported by the Technology Agency of the Czech Republic.

Keywords: 3D printing, Tactile map, Tablet

References

Barvir, R., Vondrakova, A., & Ruzickova, V. (2018). GRAPHICS COMPLEXITY OF TACTILE MAPS AND USER STUDY. International Multidisciplinary Scientific GeoConference: SGEM: Surveying Geology & mining Ecology Management, 18, 433-440.

Kieninger, T., & Kuhn, N. (1994). Hyperbraille: a hypertext system for the blind. Paper presented at the Proceedings of the first annual ACM conference on Assistive technologies.

Tekli, J., Issa, Y. B., & Chbeir, R. (2018). Evaluating touch-screen vibration modality for blind users to access simple shapes and graphics. International Journal of Human-Computer Studies, 110, 115-133.

Voženílek, V., Kozáková, M., Šťávová, Z., Ludíková, L., Růžičková, V., & Finková, D. (2009). 3D Printing technology in tactile maps compiling. Paper presented at the Proceedings of 24th International Cartographic Conference, International Cartographic Association.

Zeng, L., & Weber, G. (2011). Accessible maps for the visually impaired. Paper presented at the Proceedings of IFIP INTERACT 2011 Workshop on ADDW, CEUR.

Joint ICA Workshop on Cartography for specific users
Tokyo, July 15, 2019
ISBN: 978-1-907075-12-4

The development of the Cartographic and Geographical literacies in high school classes of the Federal District, Brazil

Vânia Lúcia Costa Alves Souza*
* costa.vania0@gmail.com

Abstract: The context of the “Curriculum in Movement” in High School substantiate the development of the diverse literacies of the young Brazilian people. In Geography classes, the cartographic and geographical literacies are worked according to different contexts in classes of the Federal District high schools. This article aims to report activities that were developed involving cartographic practices in geography classes, in order to promote these literacies. We present the mock-building activities that addressed the particularities of the space perceived and lived by the students. We see these representations as the products of a post-representational cartography that approaches the propositional map. The activities of construction of the terrestrial globe allow the discussion of the concepts of scale and representation in a practical and challenging way. Creativity appears in cartographic drawings that instigate the student to draw their space in the world. All these activities in geography classes value the cartographic language in a dynamic and participative way.

Keywords: Cartographic literacy, High School, Geography class

References

Seed F. (2014) Currículo em Movimento da Educação Básica, 2014. Disponível em: http://www.se.df.gov.br. Acesso em: 13/11/2014.

Crampton, J. W.(2001) Maps as social constructions: power, communication and visualization. Progress in human geography. v. 25, n. 2, 2001. Disponível em: <http://www.praxisepress.org/CGR/35-Crampton.pdf>. Acesso em: 24/3/2015.

International Cartographic Association
Association Cartographique Internationale

Joint ICA Workshop on Cartography for specific users
Tokyo, July 15, 2019
ISBN: 978-1-907075-12-4

Mixed 3D printing technologies for tactile map production – FDM and SLA case study

Jakub Wabiński *
* jakub.wabinski@wat.edu.pl

Abstract: There is high demand on tactile maps and atlases but their production is very expensive. Unfortunately, not all the schools teaching blind and visually impaired can afford them. Some issues contained in the geography curriculum, such as those relating to the 'small homeland', require the development of individual copies or specific maps. Traditional tactile maps production methods are cost-effective only in the case of production in large scale. This is due to the fact that preparation of printing matrix itself is very expensive. On the opposite, 3D printing does not require any specific preparations, which makes production of single maps cheaper. This technology is characterized by a fixed, low unit cost and allows rapid prototyping. Thanks to this, cartographers and geography teachers can perform tests with different materials, sign shapes and arrangement of map's content (Voženílek et al. 2009). It was already proven that tactile maps can be successfully produced using 3D printing (e.g. Götzelmann and Eichler 2016; Taylor et al. 2016). These maps are not only legible but also facilitate decoding spatial information and speed up the process of cartographic signs identification compared to maps produced using microcapsule and embossed paper (Brittell, Lobben, and Lawrence 2018). However, this approach has its limitations. Blind students, who were testing 3D printed tactile thematic map (interviewed during preparation of my master's thesis), disliked the unpleasant finish as well as sharp edges of map details, especially Braille dots (Wabiński 2017). This is true for the most popular 3D printing technology – Fused Deposition Modelling (FDM), that uses smelting of thermoplastic material. However, there is a number of other 3D printing technologies yet untested in terms of tactile map production. This is why an idea was born to mix two technologies to produce a single map: aforementioned Fused Deposition Modelling and stereolitography (SLA) that is characterized by higher accuracy and softer finish. The later was used for printing text labels. We would like to present our example thematic tactile map and experience of pupils working with it, interviewed in one of the schools for blind and visually impaired children.

Keywords: Tactile maps, 3D printing, FDM, SLA, Thematic maps, Partitions of Poland

References

Brittell, Megen E., Amy K. Lobben, and Megan M. Lawrence. (2018) "Usability Evaluation of Tactile Map Symbols Across Three Production Technologies." Journal of Visual Impairment & Blindness. Retrieved February 11, 2019 (https://files.eric.ed.gov/fulltext/EJ1200590.pdf).

Götzelmann, Timo and Laura Eichler. (2016) "Blindweb Maps – an Interactive Web Service for the Selection and Generation of Personalized Audio-Tactile Maps." Pp. 139–45 in Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), vol. 9759. Springer, Cham. Retrieved July 31, 2018 (http://link.springer.com/10.1007/978-3-319-41267-2_19).

Taylor, Brandon, Anind Dey, Dan Siewiorek, and Asim Smailagic. (2016) "Customizable 3D Printed Tactile Maps as Interactive Overlays." Pp. 71–79 in Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility - ASSETS '16. Association for Computing Machinery, Inc. Retrieved (http://dl.acm.org/citation.cfm?doid=2982142.2982167).

Voženílek, Vít et al. (2009) "3D Printing Technology in Tactile Maps Compiling." Pp. 1–10 in International Cartographic Conference, International Cartographic Association.

Wabiński, Jakub. (2017) "Methodology of Creating Tactile Maps with the Use of 3D Printing." Military University of Technology in Warsaw.