SOME REFLECTIONS ON SCHOOL CARTOGRAPHY

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Abstract
School cartography is a specific research field, but at the same time a very important area considering its role in the cartographic education of young generations as future map users. This paper begins with a brief historical overview of school cartography: first concepts related to maps taught in schools, publication of the first school atlases and other topics. Next, the most relevant moments and specialists working in this theme during the 20th century are presented, explaining how school cartography became a scientific research field. Other addressed topic is the role developed in research activities by world-wide organizations like the International Cartographic Association or the International Geographical Union. Finally, the influence of computer-based solutions is also presented, trying to find answers to questions such as: Can the use of GIS in the classrooms be considered successful and widespread? Can GIS be substituted with other web-based solutions? How will school cartography develop in the future?

Keywords: school cartography, cartography for children, school atlas, web map services, GIS

BRIEF HISTORICAL INTRODUCTION (18TH AND 19TH CENTURIES)

The use of maps in schools is an activity that dates back to a distance of around 300 years and that involves the use of different map-based educational materials such as earth globes, wall maps and perhaps the most symbolic and complex of them all, the school atlas. The 18th century can be considered the period when the use of atlases specifically published for schools began to expand to several countries. Two of the first school atlases are works related to the German mapmaker Johann Baptist Homann (1664–1724). The first atlas saw public light in 1710 under the title of “Kleiner Atlas Scholasticus”, with 26 coloured maps (Figure 1).

Figure 1. World map from the “Kleiner Atlas Scholasticus” (1710)
The second atlas was published in Nuremberg in 1719 and its Latin title is "Atlas Methodicus" with the subtitle "Explorandis Juvenum Profectibus in Studio Geographicō ...". Fourteen maps represented the countries of Europe, Asia, Africa and America, and at the same time it included four representations of the Solar System according to the ideas of Ptolemy, Tycho Brahe, Copernicus, and Descartes. An interesting detail in this atlas is that California was drawn as an island on the map of America, and appeared in the list of the names of islands too.

In 1774 in Lyon (France), Jean-Marie Bruyset published his "Atlas des enfants, ou nouvelle méthode pour apprendre la géographie ...", with 24 maps characterized by simplified content and it was even translated into English. At the end of that same century, in 1792 the first Spanish-language school atlas was published in the city of Madrid. It was entitled "Modern Elemental Atlas or collection of maps to teach children Geography with an idea of the Sphere". Its author was Don Tomás López, who was a named Spanish geographer and cartographer. The atlas counted with an introductory text of 24 pages followed by 27 maps. A main characteristic of this atlas (apart from the degree of detail of the maps) was that it enriched the example of the Homann Methodical Atlas, since the Introduction explained basic concepts of Astronomical Geography and there were two pages dedicated to the graphic representations of this topic (Figure 2).

The first school atlas in the American continent was published by Mathew Carey in the United States three years later, in 1795: "The General Atlas for Carey's Edition of Guthrie's Geography Improved". However, Carey had already published the maps of this atlas previously in his others atlases for adults according to Patton (1999).

![Figure 2. Fragment of one of the two pages dedicated to Astronomical Geography in the “Modern Elemental Atlas” of Don Tomás López (1792)](image)

Textbooks on Geography cannot be forgotten when researchers write about the beginnings of school cartography. For centuries, these books were mainly textual descriptions complemented by data related to the given topic. Different types of illustrations increasingly accompany the texts during the 18th century; the first diagrams or charts began to be included only in the last decade of this century. The most influential changes occurred already in the 19th century, when authors began to illustrate or complete the text using thematic maps. Reliable examples are the textbooks on Geography written by the French professor, economist and historian Pierre Émile Levasseur, who was later named honorary president of the French Geographical Society. In his books, the pupils found maps that were made using the most innovative methods of representation at that time, even including solutions that would be the starting point for new representations to be developed in the future, such as cartograms.

Levasseur not only wrote textbooks, but also created school atlases that included an introduction containing a very detailed graphic and textual presentation of elementary concepts related to astronomy, maps and geography, in addition to combining the maps of his atlases with detailed texts. At the same time as France, other European countries also paid special interest to the edition and publication of school atlases, highlighting names as Stieler or Sydow in the current Germany or Hölzel and Freytag & Berndt in Austria.
A country with a highly diversified development of school atlases in the 19th century was the United States. Numerous publishing houses issued this type of atlas, and names such as Sidney E. Morse, Nathaniel G. Huntington, Jessie Olney and William C. Woodbridge, among others, would be identified with school atlases published by them. Perhaps the best-known episode corroborating the rise of North American school atlases in this century is that after his journey through South and Central America, Alexander Humboldt measured the data needed to create the first world map for the representation of the variation of temperature on Earth with isotherms. This map was first drawn by William C. Woodbridge in 1823 and was published in his school atlas of 1826 (School Atlas designed to accompany Woodbridge's Rudiments of Geography). It preceded the publication of the map in Europe, which occurred years later in the famous Berghaus Atlas of 1838. The first historical school atlas made by a woman was also published in the United States: it was the “Ancient Atlas” (New York, 1828) by Emma Willard, a teacher who became the first female cartographer in the country. Lastly, I would mention the 91 editions over a 21-year period (1829–1860) of the school atlas published by Jesse Olney, whose title is “School Atlas to Accompany the Practical System of Geography for Schools and Families” (Patton, 1999).

The impetuous development experienced in the art of map making and the emergence of cartography as a science laid the foundations for the development of scientifically based research related to the theoretical principles of school cartography and its application in schools in the 20th century.

SCHOOL CARTOGRAPHY IN THE 20TH CENTURY

The first works describing the results of research on school cartography began only to be published in the first half of the 20th century. One of the first articles was dated in 1933, when Helen M. White published the article “Diagrammatic Map Making” in the Journal of Geography (USA), presenting different examples of maps made by teachers in their classes. The Hungarian-born American cartographer Erwin Raisz also mentioned her work in his "General Cartography", which was the first Cartography textbook published in the United States and the only one used in American universities for the next 15 years (Raisz, 1938). Previously, Raisz also developed research on the making of cartograms and remarked that “its educational value is not limited to the schools: it may serve to set right common misconceptions held by even well informed people” (Raisz, 1934) (Figure 3).

In 1962, Raisz mentioned again the maps manually drawn by teachers in schools (called by him "blackboard maps") and wrote about the school atlases in his textbook "Principles of Cartography" (Raisz, 1962).

The decades from the 1960s to the 1990s brought the boom of research related to this topic. A key figure in this period was the American geographer and cartographer Barbara Bartz Petchenik (1939 –1992), who was the first female vice-president of the International Cartographic Association (ICA) between 1991 and 1992. In 1976, together with Arthur H. Robinson, she wrote the book entitled “The Nature of Maps”, which is considered a classic work in Cartographic Communication. In her articles on maps for children, she studied which types of maps are easier to be understood by children, analysed the difficulties that they face when reading the values of the scales and using coordinates, as well as analysed the symbols and typography of the maps to be used in schools, making specific recommendations on how to make better maps for them. In 1993, after her death and in tribute to her memory, the ICA began to organize the International Map Competition for children that bears her name.

Beginning from the second half of the 1960s, Barbara Bartz Petchenik wrote articles on school cartography with ideas and proposals that remain valid despite the passing of the years. Only one example: in her article about atlases for children published in 1987, she asks a series of questions that should be answered by the atlas editor as: What is the
point of creating atlases for children? What, really, is a “children’s atlas”? How does it / should it differ from an “adult atlas”? Who decides what information goes in atlases? Are there fundamentally different kinds of “children’s atlases”? How does atlas content relate to the total school curriculum? How do maps as a form of information relate to all other forms in which information is presented to and obtained by children? Is it possible to establish any meaningful, specific standards in comparison to which atlases can be evaluated, or which would allow one atlas to be judged „better” than another? Are there any widely acceptable „first principles” which apply to atlas development in the following domains, for example: perceptual, cognitive, affective, geographic/spatial, societal, utilitarian, aesthetic, political, commercial? What about the future? Are technological/societal changes now underway going to render this current discussion obsolete? (Petchenik, 1987)

Remembering those colleagues who developed significant research activity related to maps for children I could not omit the name of Simon Catling, Professor Emeritus of Primary Education at Oxford Brookes University, United Kingdom. He is currently retired, however already involved in active professional life participating in events, where presents his valuable ideas related to children’s geographical knowledge, the primary geography curriculum and how children can use maps in the classroom and out-of-school activities in a more effective way. Catling began his research activities in the second half of the 1970s, focusing on topics as children and cognitive mapping as well as children’s spatial conception in the geographic education. In his articles and books, he always defended that “the use and study of maps is central to geographical learning and understanding”, as he wrote in an educational guidance material expressly written for teachers after 2005 (Catling, n.d.). One of his latest works is the “Understanding and Teaching Primary Geography” book, which wrote with Tessa Willy (Kingston University) and published in a second edition in 2018.

Other of the most recognized specialists in the decade of 1980s was the geographer David Boardman, who taught at the University of Birmingham. His main research theme was children’s understanding of maps, on which he published numerous scientific articles studying diverse themes as how young children can identify features on vertical aerial photographs and large-scale maps of areas known by them (Boardman, 1989). His book entitled “Graphicacy and Geography Teaching” (published in 1983) constituted one of the obligatory reference works for specialists interested in this topic.

In this period, the list of colleagues working on themes related to school cartography in different countries became very extensive and it is practically impossible to mention all of them. Articles written by Mark Blades, James M. Blaut, Rodney Gerber, Herbert A. Sandford, Christopher Spencer and others can be found in the scientific journals published in those years. Other numerous colleagues (less known internationally by different reasons) also developed an important scientific career in their countries, as Prof. Lívia de Oliveira from the Sao Paulo State University, who is author of pioneer works related to school cartography in Brazil, beginning with her MSc thesis entitled “Methodological and Cognitive Study of the Map” from 1977 (Oliveira, 1977).

However, the works developed by individuals are always determinant for a strong scientific base of a research area; colleagues cannot forget the role played by international organizations. The research related to the role of maps in the children’s geographical education is also present in the development of scientific activities encouraged by these organizations. First, I should mention the International Geographical Union (IGU), which was officially founded in Brussels, Belgium in 1952. In this year was founded the Commission on the Teaching of Geography, which membership was formed by geographers interested in the geographical education in general, but more specifically in primary and secondary education. During the decade of 1960s the commission worked together with UNESCO to draft a Source Book for Geography Teaching, which included also themes related to map use by pupils. The book was published in 1965 and was translated into eleven languages in the following years (Graves and Stoltman, 2016). From the IGU Congress held in Montreal in 1972, the name of the commission was changed to the current “Commission on Geographical Education” and it follows organizing periodically scientific events that include also themes related to school cartography.

Already in the late 1950s, a group of internationally recognized cartographers took the first steps to create an international organization specifically dedicated to cartography. Despite some initial contacts with the IGU in 1957 to discuss the possible inclusion of a cartographic section in this organization, representatives of thirteen countries founded the International Cartographic Association (ICA) in Bern, Switzerland in 1959 (Ormeling, 1985). For a relatively long time, colleagues working in school cartography did not count with a commission dedicated to this research area in this association. After the great success of the first International Children’s Map Competition and Exhibition held in Cologne (Germany) in 1993, colleagues developing research on cartography for children in general and in school cartography in specific considered that the conditions were given for the foundation of a commission representing this area. In 1994, a joint Canadian-Brazilian survey was conducted to investigate the international level of interest and support to a formal working group concerned with children’s graphic literacy and children’s relationships with maps in this period of changing technology (Anderson and Vasconcellos, 1995). As a direct consequence of this study, the Cartography and Children Working Group was founded at the ICA 10th General Assembly in Barcelona in
In 1995. Four years later, recognizing the valuable activities developed by the working group to encourage and publicize research related to this topic as well as the growing international interest towards the Barbara Pechenik Competition, the ICA 11th General Assembly approved the group to become the Cartography and Children Commission (Anderson, 2006). Names of researchers as Jacqueline Anderson (Canada), Regina Araujo de Almeida (Brazil), Henry Castner (USA) and Patrick Wiegand (United Kingdom) should be highlighted because of their role in the organization and posterior development of the commission among their scientific contributions to school cartography:

- Jacqueline Anderson (Concordia University, Canada), who developed research on themes related to the use of maps by younger children and the teaching of map skills at early ages. She was first the promoter of the foundation of the working group and later first Chair-person of the Commission.
- Regina (Vasconcellos) Araujo de Almeida (University of São Paulo, Brazil), who participated with Jacqueline Anderson in the organization of the working group and the commission. In her most notorious research projects, she devoted herself to studying the role of cartography in the education of blind and partially sighted children, as well as the cartographic education of Amazonian indigenous peoples in Brazil.
- Professor Henry W. Castner (USA), who in his articles addressed cartography for children in the broader framework offered by the geographic education, developing research on themes related to space perception by children, cartographic and geographic questions in the development of school curriculum, use of map projections in the classroom and the educational taxonomy for maps.
- Patrick Wiegand (University of Leeds, United Kingdom), who conducted research related to the use of maps by children in schools, studying the development of cartographic skills of pupils from their earliest ages. Author of a work already considered anthological on this research area (“Learning and Teaching with Maps”, 2006), he applied the results of his research in practice as the advisor-editor of numerous school atlases published by the Oxford University Press in recent years. He served as Chair-person of the ICA Commission on Cartography and Children from 2003 to 2007.

IGU and ICA commissions supported the research activities with the organization of meetings and international events, which constitute an opportunity to meet personally colleagues from different countries, to present results of current research projects and to exchange ideas about ongoing or planned research activities. Many of the works presented at these events have been the basis for the publication of scientific books related to school cartography in different languages and countries.

CURRENT RESEARCH ON CARTOGRAPHY FOR CHILDREN AND SCHOOL CARTOGRAPHY

Readers found two essential terms used in this article to distinguish our research themes from other cartographic topics: cartography for children and school cartography. Figure 4 intends to reflect on the relation between them: cartography for children can be considered a wider term, ranging from studying the first experiences acquired by children about their surrounding space and their individual orientation within this space to the use of maps at the secondary level of education. School cartography overlaps cartography for children: it begins when a child became pupil in the kindergarten or elementary school and includes the learning of spatial orientation without and with maps, the teaching of concepts related to maps, as well as map use in schools and in out-of-school life, together with orientation and experience on creating map-based educational products.

Colleagues continue to develop their research activities, very often in themes that overlap both terms. If we try to classify the general research themes or areas, five main categories could be obtained:

- Theoretical bases related to children’s map knowledge: spatial thinking, spatial representation, etc; in general, theoretical knowledge related to map reading and understanding
- Teaching methodologies and materials (maps, atlases and other materials used in schools)
- Technologies used in school cartography (traditional and digital technologies)
- Teacher training and curriculum development
- Study of out-of-school activities related to children’s cartographic knowledge in its broadest meaning
We cannot ignore that very often school cartography overlaps other research areas within cartography (e.g. geovisualization, GIS, web cartography, etc) and other related scientific areas (e.g. data visualization, pedagogy, etc). Other important field overlapped by school cartography is the cartography for blind and partially sighted people, which in our specific case means all the studies related to the edition of atlases, maps and other cartographic products to be used by disabled children in the schools and their daily life. Colleagues can periodically find this research theme in events and publications, because it counts with a rich tradition not only within the ICA, but also in other international organizations too.

At the same time, other less researched themes should not be forgotten either, e.g. the teaching of map use for pupils in special schools, which includes the need of children with learning disabilities, communication disorders, emotional and behavioural disorders, physical disabilities, and developmental disabilities among others. Due to the few research done worldwide, colleagues should encourage the development of projects on this topic e.g. by MSc and PhD students.

It is also very important to carry out new international projects, which allow specialists to better understand the differences and similarities of school cartography in different countries, trying to adapt the obtained results or continue developing them together. There have been developed international projects such as the Hungarian-Argentine research entitled “Use and interpretation of maps by school-age children” (2004–2005). One of the suggestions made in this project was the study of new cartographic solutions for their use in maps for children. A result derived from this idea was the Hungarian-Argentine project entitled “Possible uses of the Chernoff faces for data visualization in school cartography” (2008–2009) followed by the Hungarian-Austrian project “Use of Chernoff faces in school maps” developed in 2010 and 2011.

The impact of technological development experienced in the last 30 years is also present in research topics. Already in the decade of the 1990s, works began to be published whose subject was focused on the use of computational techniques in school cartography, studying and predicting the influence that those techniques exerted in subsequent years. It is reflected in the research projects developed by members of the ICA Commission on Cartography and Children, as well as works carried out in the IGU Commission on Geographical Education. In national, regional and international events became habitual the presentation and discussion of papers on topics such as:

- The publication of digital materials for schools, e.g. the publication of school atlases on compact discs and other media, often as annexes or extensions of paper-printed atlases. In the 21st century these atlases continued to develop, becoming more complex educational materials, which included not only interactive maps combined with multimedia representations, but also exercises and games based on the guidelines of the national curricula and therefore of the textbooks. In recent years, these materials have been developed for their use in combination with digital whiteboards and tablets.
• The use of GIS in the teaching of Geography and other subjects, its possible use as an effective tool to complete the traditional teaching methods and as a tool used by pupils to answer questions and solve tasks given by the teachers.

• Internet and especially the web as an innovative tool in the transmission of information. Among its many roles and purposes, it has been used to teach and popularize basic cartographic knowledge for the new generations. Already in the 21st century, school cartography is also influenced by the appearance of Google Maps and Google Earth on the market and the role of web map services in teaching activities constitute the subject of many research projects today.

• Mobile-based solutions in school cartography: a relatively younger research theme, studying how teachers and pupils could take advantage of the mobile technologies in activities inside and outside the classroom.

I would like to make a few short reflections on the last three topics that are closely related to each other. The research projects related to GIS in schools have been developing since the 1990s. Despite this, we cannot affirm that we have witnessed the general and successful widespread of the use and teaching of this technology in (mainly secondary) schools in the last 30 years. There were/are different reasons for this situation:

• High costs of GIS software: it was a typical problem in the last decade of the past century and beginnings of the 21st century, but the offer of free and open source software (e.g. QGIS) made GIS accessible for those educational institutions with low budget in less developed countries too.

• Difficulties with the GIS formation of teachers: International research projects confirmed that teachers recognized the importance of using GIS in educational activities, but also faced problems to incorporate GIS to these activities. Research developed by Baker et al. (2009), Wheeler et al. (2010), Höhnle et al. (2011) and Singh et al. (2012) considered the lack of time to develop lessons and the lack of practice of the teachers using GIS as crucial factors discouraging the use of GIS in the classrooms, followed by other factors that can be characteristic of a specific country as irrelevance to syllabus (Singh et al., 2012), lack of knowledge about concrete integration of GIS in teaching and lack of interest of other subjects for an interdisciplinary GI(S) cooperation (Höhnle et al., 2011), difficulties in booking the necessary computer labs for GIS lessons (Wheeler et al., 2010) or variable skill levels among students (Baker et al., 2009).

• Decrease in the number of hours dedicated to Geography teaching: However, GIS can be used as a powerful tool in different subjects (e.g. History and Biology), teaching activities about or supported by GIS can be mainly developed in subjects related to Geography. Unfortunately, in the last years we can see a continued decline in the number of hours planned to teach Geography in the majority of European countries. This fact also exerted negative influence in the efforts trying to incorporate GIS into the teaching activities for pupils in the schools. Despite this, some projects try to find solutions to compensate for the decrease in the number of teaching hours. One of them can be the teaching of GIS in activities programmed outside the prescribed class time, e.g. as an optional course (Dékány, 2020).

The factors given in the second and third points are still valid in a vast majority of countries. By this reason, those colleagues interested in developing the teaching and use of GIS in school activities, should find answer to an important question: Did teachers and pupils take advantage of all the options offered by GIS software in those few schools where it has been implemented? Or asking the same question in another way: is it really needed to use GIS in secondary schools to innovate and strengthen teaching activities, to make teaching more interesting and to further involve students in these activities? The results of projects developed in this topic in the last two decades included different types of maps made by pupils using GIS solutions. If we analyse the themes of those maps and the solutions used to represent data on the maps, we can conclude that in a high percentage of cases they are univariate thematic maps that could be made using other less complex software. Taking into account the lack of time and practice of teachers to learn GIS, we should consider the implementation of other GIS- and web-based solutions, which are easier for teachers and pupils to learn and use in the classes or in out-of-school activities. Other factor to be considered when deciding which specific solution can be used in classrooms (and outside of them), is to give preference to services and applications with which they are familiar and are also used in daily life. By these reasons, specialists began to seek new research topics and many results and examples corroborate that one of the most popular solutions is the use of Google Maps as web mapping service and Google My Maps as application to create simple maps. Surfing the web, colleagues can find different projects offering from more general solutions as mapping directions or adding images and videos to a map (Elliot, 2009) to more specific solutions on how to use Google My Maps to illustrate and complete knowledge acquired in the classroom, e.g. working out topics related to the Geography subject (Reyes and Kiss, 2018) (Figure 5).

Teachers can also use online GIS and cartographic applications if they wish to enrich their pupils’ abilities. One of the most significant obstacles to solve GIS-based exercises in the classroom is the lack of free and trustworthy databases and base maps. I can suggest two possible solutions depending on the type of maps that teachers wish their students to make:
Figure 5. Two maps made by 15 year-old pupils of 9th grade in a Hungarian secondary school. The topic to represent was related to the Geography of Water: above, representing the areas taken from the sea and the dams in the Netherlands, below a map of the Great Lakes region in North America. Both maps were made using Google My Maps (Reyes and Kiss, 2018).

- If the main aim is to teach or to use the options offered by GIS at a basic level, then ArcGIS Online (www.arcgis.com) can be the appropriated choice. Any interested person can open a free account on this website and will have access not only to simple, but smart map editors that are easy to learn. Furthermore, the user can have access to layers and data created and made public by their authors, as well as to a Living Atlas, a free collection of thematic maps. Finally, you also will have an option to create your own presentations and specially story maps, which are interactive multimedia materials to make your maps more dynamic and to combine them with texts, images, videos, etc. Story maps became a very popular solution to present maps and educational materials for the public in general in the last years. Using story maps specialists can even create an online school atlas, as demonstrated by a research project developed by Spanish universities entitled “School Digital Atlas: Learn Geography in Secondary Education with ArcGIS Online” and whose general idea can be accessed at the following address (Miguel González et al., 2016):
  
  http://atlas-escolar.maps.arcgis.com/apps/MapJournal/index.html?appid=77ae3ecf94174a2fb21abda32b564f4

- If the teacher is only interested in having pupils create their own thematic maps, then a GIS-based, but simpler online map editor can constitute a good solution. One example is the Datawrapper website, created by Gregor Aisch ("visualization architect, interactive news developer") in 2017 (https://www.datawrapper.de/). Using it you can create a chart, a thematic or a locator map, but you should have your own data in text or Excel format.
The limitation for a free account is that you cannot export your map, however you can use a link to visualize it on the web or can get a HTML code to embed it into a homepage.

FUTURE OPTIONS?

Another challenge to be faced by the school cartography is the adaptation to teaching activities of solutions conceived for mobile devices. Visiting webshops users can find numerous LBS (Location-Based Systems) applications that have been developed e.g. for tourists. In contrast, the number of educational map-based applications created not specifically for teaching activities (e.g. atlases for the public in general) is relatively low, and there are practically no applications created for the school cartography (e.g. school atlases). At the same time, the majority of atlases developed for mobile devices can be classified as view-only atlases (those with some advantages such as fast random access to maps and a minimal interactivity) according to the definition given by Kraak and Ormeling (1996). It means that those products do not make use of the advantages offered by mobile-based solutions that have been described in articles related to ubiquitous cartography, Location Based Systems and others.

A school atlas developed for mobile devices could be considered a combination of diverse existing solutions that can include view-only maps combined with the flexible cartographic models defined by Safiza (2007), after its adaptation to the didactical aims of school cartography and for a particular group of users formed by scholars and teachers. These dynamic maps are visualized as the result of an adaptive representation made after positioning the user in space and time, and collecting data related to the user’s environment. School atlases can be developed to more complex educational materials taking advantage of LBS options offered by mobile devices, including adaptive geo-exercises related to the pupil’s place, that is, combining pre-stored and LBS data to word the questions (Reyes, 2013).

3D solutions are also developed for mobile devices, even though currently the use of 3D mobile devices is very limited due to the insufficient technological development. Different devices (e.g. glasses-free, autostereoscopic parallax barrier displays) have been tested and put out for sale, but without real success and they did not make their presence felt in the market. Despite this situation, specialists are testing different mobile applications designed for the future, using the options offered by the Augmented Reality (AR). Only two examples: in 2019 was founded the Elsa 3D MAP Hungarian startup, which is making 3D maps in Augmented Reality specifically designed for education (Zsoldi, 2020). In the startup’s website you can find examples of physical and thematic maps developed specially to be used in teaching activities. During the 29th International Cartographic Conference celebrated in Tokyo in July 2019 participants had the opportunity to listen to the ideas presented by a young Bulgarian researcher, Nikolai Yonov, about how Augmented Reality could be used to complement the visualization of a school atlas with thematic information (data, images, 3D models) collected and updated in real time (Yonov, 2019). Could these technologies be applied in schools in the near future? All of us should be confident that a positive answer can be given to this question in the coming years.

REFERENCES


**BIOGRAPHY**

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 almost 30 articles in scientific publications and more than 75 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 Outstandings Services to ICA in 2015.