

# STUDY OF THEMATIC MAP USE IN ARGENTINE AND HUNGARIAN SCHOOLS

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## FELMÉRÉS A TEMATIKUS TÉRKÉPHASZNÁLATRÓL ARGENTIN ÉS MAGYAR ISKOLÁKBAN

### Összefoglalás

*Jelen projekt megszervezése a magyar és argentin kormány által aláírt, tudományos kutatásokat támogató bilaterális egyezményen alapult. A résztvevő szakemberek készítettek két azonos kérdőívet, hogy a tematikus térképhasználattal kapcsolatos információkat gyűjtsék össze mindkét ország általános iskoláiban oktatók és tanulók között. A kutatás célkitűzései között szerepelt megvizsgálni a térképészeti alapismeretek oktatásának jelenlegi helyzetét mindkét országban, valamint felismerni a térképészeti alapismeretek oktatása során felmerülő nehézségeket, illetve a tematikus térképhasználatban megfigyelhető pozitív tapasztalatokat a lehetséges jövőbeni kölcsönös alkalmazás érdekében. A kutatás végeredménye magában foglalja a résztvevő szakemberek által készített jelentést a felmérés eredményeivel és az oktatási rendszerekben talált pozitív jellemzők bemutatásával. Minden adatbázis, eredmény, összehasonlítás és javaslat megtalálható a projekt honlapján.*

### Summary

*This project was organized on the basis of a bilateral agreement signed by the Argentine and Hungarian governments to support research in various fields. Participant specialists prepared two similar questionnaires to collect information about the use of thematic maps by teachers and pupils in elementary schools in both countries. The main aims of this research are the analysis of the actual situation in the teaching of map concepts in both countries, the identification of difficulties to face during the teaching of map concepts, and the recognizing of positive experiences on teaching and use of thematic maps in the interest of their possible adoption in both countries. The result includes a document written by specialists in the respective countries to review the results reached during the survey and the positive aspects found in the educational systems. All the databases, results, comparisons, and proposals written by the participants are placed on the Web.*

## Organization of the international cooperation

The specialist members of both research teams exchanged their first ideas about this project during the meetings organized yearly by the ICA „Cartography and Children” Commission. The interest in this theme (to study how the pupils of both countries understand the information represented in maps in the classroom) was accentuated by two special factors: Argentina and Hungary are two countries geographically distant from each other, situated in continents of very different political, economical and social characteristics, and these countries have only little experience of joint research in the field of education and cartography.

A bilateral agreement for the support of scientific research, signed by the Argentine and Hungarian government, was announced in 2003. In about three months, the research teams were organized with three Hungarian and five Argentine specialists from the fields of cartography and geography. Both teams presented the common project entitled *Map reading by children in school age: Cartographic education and practice in Hungary and Argentina* for the institutions responsible of this cooperation in the respective countries, and the project was approved for a period of two years between 2004 and 2005.

During our previous contacts, the general aims of the project were determined:

- Analysis of the actual situation in the teaching of map concepts in both countries.
- Research about the use of maps by teachers and pupils in elementary schools.
- Identification of difficulties to face during the teaching of map concepts.
- Recognizing of the positive experiences of teaching map concepts in the interest of their possible mutual adoption.

We decided to divide our research in two parts, corresponding to the number of years of the project:

- During the first year (2004) we would study the use of thematic maps in elementary schools, how pupils and teachers use these maps in their daily work after the study of the elemental cartographic concepts.
- In the second year (2005) we would study how pupils understand the methods of representation of relief in the different maps (mainly atlases, wall maps, and – in very few cases – topographic maps) used in the classrooms.

## Design and structure of the tests

After the study of the characteristics of both educational systems (specifically in which grades the pupils learn the elemental concepts related to maps and when they begin to apply these concepts in practice), we took the decision of applying the planned test to 7<sup>th</sup> grade pupils of Elementary Schools in the case of Hungary and to 1<sup>st</sup> year pupils of Secondary School in Argentina. To take this decision we considered that in Hungary the pupils learn elemental map concepts between grades 3 and 5. During 6<sup>th</sup> grade, they use more often the maps in the subjects related to Geography and History, and by the beginning of the 7<sup>th</sup> grade, the pupils should have practical experience that lets them answer the test about thematic maps. In Argentina, the reasons were very similar, focusing attention on when pupils learn concepts related to maps and have at least a minimal practice using maps in the classroom. In Argentina, the practical use of maps presents a serious difficulty: there is no systematical edition of School Atlases and teachers and pupils have to use atlases published for the public.

In the interest of planning a cheap survey, we decided that the test should be printed in an A5 format, with a maximum of four questions designed in black and white. This was important because the Argentine specialists did not have any kind of financial support to execute the survey in their country in 2004, while the Hungarian team had only financing

for the first part of the project (the bilateral agreement finances only the exchange of specialists between both countries). We had to word the questions taking into account these limitations, because the absence of colours could not mean an obstacle to understanding the information represented in the maps.

After numerous consultations, the four questions of the test were penned after the following principles:

**1<sup>st</sup> question (Figure 1)**

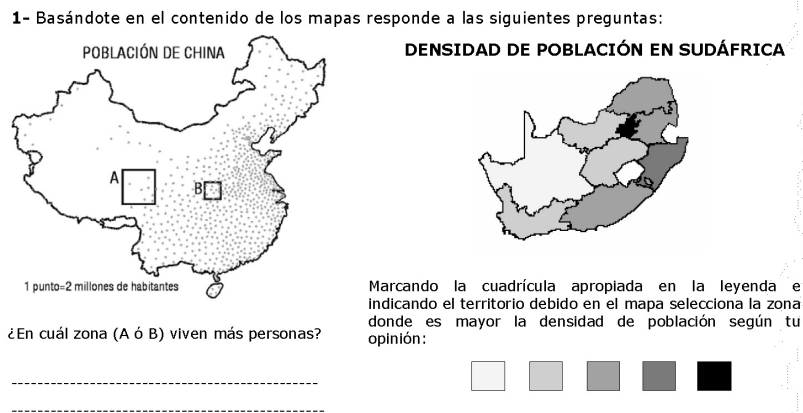


Figure 1. First question of the Argentine test

We would evaluate the use of two methods of thematic representation (points and choroplets) to draw similar themes (population and density of population) in two different maps (in the Hungarian test these maps were of China and Venezuela, in the Argentine test China and South Africa). In the point map, two squares were delimited, and asked in which of them live more people and which of them has the highest density of population.

In the legend of this map, the pupils could read the equivalence of a point and the population number. In the second map, five shades of grey were applied to identify the density of population, without any textual or numerical information about the meaning of these shades in the legend. We asked the pupils to indicate which tone of grey represented the highest density of population in the legend and the map.

The purpose of this question was to determine if pupils were able to draw a parallel between the two methods of representation, to realize that the highest density of points and the darkest choroplet areas have a similar meaning in both maps.

**2<sup>nd</sup> question**

Filling of a text based on information represented in a historical map about the exploration of African coasts by the Portuguese navigators in the 15<sup>th</sup> century (Figure 2).

History was selected because during the teaching of this subject teachers use a considerable number of maps to illustrate their explanations and the pupils work very often with maps included in textbooks, workbooks, atlases, etc. We cared to redact a text that made the pupils read the information offered in the map to fill it.

In this question we wanted to evaluate how the pupils could understand the thematic information represented in a map with content that did not relate directly to a geographical subject. We used the same text and map in both countries.

3<sup>rd</sup> question

The task was the reading and joint analysis of two methods of representation (diagrams and choroplets) in the same map. In the Hungarian test, the pupils had to answer three questions related to environment protection, represented in a map of the country (Figure 2):

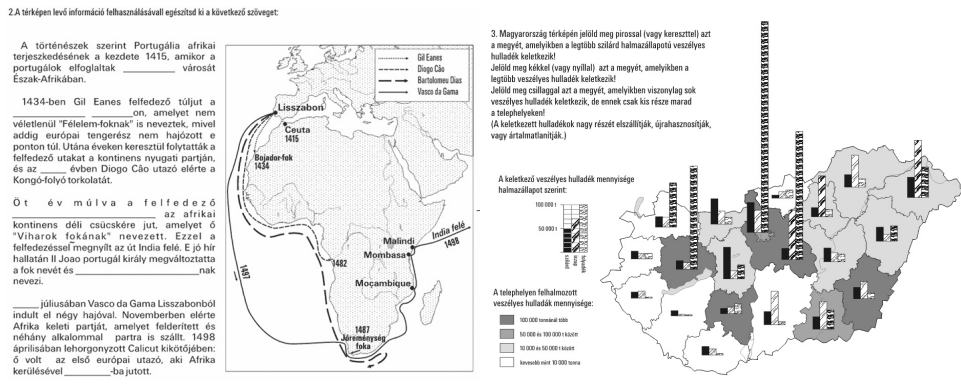


Figure 2. Second and third question in the Hungarian test

- In the first one pupils had to compare visually only one column of the diagrams (to identify the province with the highest volume of dangerous solid waste),
- In the second one they had to analyse all the columns of the diagrams (to identify the province with the highest volume of dangerous waste),
- In the third one they had to interpret the content of the diagrams and the values represented by choroplets (to identify the province with a relatively high volume of dangerous waste, but only a small part of this volume is stored in that county, namely, it is not translated for recycling).

In the Argentine test a map of Buenos Aires was used, applying the same methods to represent the thematic information (total of grassy areas represented by choroplets, as well as the number of parks, squares and gardens represented by diagrams) and putting two questions:

- Which is the district with the largest number of grasslands?
- Which is the district with the highest number of squares in the city?

4<sup>th</sup> question

Drawing of thematic information on an outline map, based on data and legend attached to it. We offered the choice to create their own symbolization (in black and white or colour), and represent the symbols in the legend. In Hungary a map of the western provinces was used, and in Argentina a map of some districts of Buenos Aires (Figure 3).

Applying of the tests

In Hungary, 1534 pupils answered the questions of the test, while in Argentina 567 pupils participated in the survey. The major part of the Hungarian pupils (72.7%) were 12 years old, in Argentina 48% of the participants were 13 years old and 42.7% were 14 years old.

In Hungary, the selection of the participant schools was made in a representative way, selecting at least one school from each county, and trying to have a similar proportion of schools in cities and smaller towns (44 schools from 34 cities and 24 schools from 24 towns

were asked to participate). From the sixty-eight contacted schools thirty-eight sent back their answers.

4- Completa el mapa de "Barrios" de la Ciudad Autónoma de Buenos Aires (Capital Federal) utilizando los datos y la leyenda. Ten presente que en el mapa solo encontrarás algunos de los Barrios que conforman a la Ciudad Autónoma de Buenos Aires. Si trabajas solamente con un lápiz negro utiliza la leyenda situada a la derecha de las categorías. Si trabajas con lápices de colores, entonces rellena con el color que selecciones las cuadrículas ubicadas a la izquierda de las categorías.

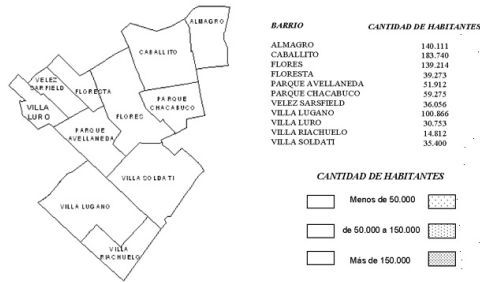


Figure 3. The last question in the Argentine test

The time given by the teachers to answer the test varied between the participant schools. In Hungary, 138 teachers answered to a test designed for them, asking about the use of thematic maps in the classroom and other topics. One of the questions was about how much time the pupils spent on responding the questionnaire; only 73 teachers answered this question. Based on their answers, 33.3% of pupils had between 21 and 30 minutes to complete the test, and 29.2% had between 10 and 15 minutes.

The Argentine organizers faced more difficulty to collect their data at a national level: the large extent of the country (the province of Buenos Aires is equivalent to the whole territory of Hungary), and the difficult communication with the remote regions represented a serious obstacle, and all this was aggravated by the unstable economic situation. They made and distributed the tests without any financial support. Finally, they succeeded in collecting answers from 10 schools. Pupils filled the tests without any special explanation and the time spent to answer the questions varied between the different schools.

### General results of the tests

The obtained results are summarized in Table 1. This table contains the results according to the answers received until March 30, 2005 in Hungary and December 10, 2004 in Argentina. The dates do not coincide because the school year begins at different times in these countries.

### Analysis of the results

#### Hungary

In the 1<sup>st</sup> question there were no significant difficulties to read the information represented by points. The result of the second part of this question is interesting, because the majority of pupils did not have any difficulty to identify the highest density of population in the legend (they did not receive any written help about the meaning of the shades), but only a 52.6% of them identified correctly the data in the map. We should consider that within the 47.4% of wrong answers a part of the pupils marked the correct square in the legend, but did not pick out it in the map. We can say that only one of two pupils associated properly

the similar meaning of both methods of representation in the maps, having the needed ability and practice to recognize that the darker shade of a colour is used to represent higher data values. It can be considered also an ambiguous result, reflecting that about a half of the pupils had difficulties to complete this kind of exercise.

At first sight, the results of the 2<sup>nd</sup> question are not satisfactory: the 67.3% of pupils made at least one error while they filled the text reading the information represented in the map. However, exactly 51.6% of this group of pupils made only one mistake and 23.5% two mistakes (a total of 747 children). More frequent mistake made by the pupils was the change of digits of a year (for example, writing 1842 instead of 1482) or the change of the discoverers' name (writing Vasco da Gama instead of Bartolomeu Dias). This second kind of mistake is probably explained by the fact that the pupils could not read correctly the data in the map: at this point of the map four data were represented in a very small space (please note that the page format for the test was A5), but on the other hand, the location of the lines showing the two discoverers' routes were very close to each other.

The results of the 3<sup>rd</sup> question raised the highest interest among us, because this question evaluated the children's capacity not only to read, but also to analyse the represented information. The first part was only an introduction, asking pupils to read information drawn in a column of the diagram, and the second one required the reading of the whole diagram. A major percentage of pupils did not have difficulties to give the correct answers to these questions. The main obstacle was the final part of the question, when the children were requested to analyse diagrams and choroplets together: 40% of the answers were erroneous. A total of 101 pupils did not answer this question; they were not included in the calculated 40%. A possible reason of the questions without any response can be the lack of time. However, at same time we could observe that those pupils, who gave right answers to the first two points, did not response correctly this one. In other words, they are able to read literally the values in a diagram, but they do not have the sufficient practice to analyse values represented together by different methods in the same map.

The main aim of the 4<sup>th</sup> question was to measure the pupils' abilities to create themselves an easy (choropleth) thematic map. We can consider satisfactory the obtained result, because the majority of the pupils put correctly the given data to the appropriate categories. To detail the information contained in *Table 1*, a total of 1042 answers were made in black and white, and 351 pupils used colours to fill their map. We assessed these works from a graphical point of view too and more than a 70% of them obtained an evaluation of good quality in the tracing of lines, filling areas, etc. This fact demonstrates that a noteworthy percentage of the pupils denoted interest in tasks that let them express, with some liberty, their graphical abilities.

## Argentina

In the 1<sup>st</sup> question, the majority of the pupils (94.7% of them) did not answer the question related to the density of population in China. This was an unexpected result, because we considered the first two questions easier than the last two. The Argentine colleagues' opinion is that this high percentage of no answers could have a main cause: namely, pupils do not work with this method of thematic representation in the classroom. We can notice a similar trend in those Hungarian and Argentine cases when the pupils had to identify the areas with the highest density of population represented by choropleth without any explanation in the legend: 387 children (68.2%) did not answer this question (if we add the 43 wrong answers, it means 75.8%). This percentage is relatively higher than the 47.4% of wrong answers in Hungary, and we can affirm that a considerable number of pupils were not able to associate the two methods of representation.

Table 1

RESULTS OF THE SURVEY FOR PUPILS (SHORT VERSION)						
	ARGENTINA			HUNGARY		
<b>1<sup>st</sup> QUESTION: Similar information represented by points and choroplets in different maps</b>						
	Right answers	Wrong answers	No answer	Right answers	Wrong answers	No answer
Map of China: -Territory with highest number of inhabitants	489	75	3	1418	116	-
-Territory with highest density of population	22	8	537	1260	273	1
Map of Venezuela/South Africa: -Highest density of pop. in the legend	394	126	47	1160	374	-
-Highest density of pop. in the map	137	43	387	807	727	-
<b>2<sup>nd</sup> QUESTION: Filling of text based on information represented in historical map</b>						
	Right answers	Answers with one or more errors	No answer	Right answers	Answers with one or more errors	No answer
Topic: Exploration of the African coasts in the 15 <sup>th</sup> century	180	373	14	501	1033	-
<b>3<sup>rd</sup> QUESTION: Analysis of two methods of representation (diagrams and choroplets)</b>						
	Right answers	Wrong answers	No answer	Right answers	Wrong answers	
-Reading of information represented in a column of a diagram	378	13	176	1386	47	
Hungary – Reading of information represented in the diagram Argentina – Reading of information represented by choroplets	415	121	31	1251	182	
-Joint analysis of information represented by diagram and choroplets	-	-	-	818	615	
				No answer: 101		
<b>4<sup>th</sup> QUESTION: Drawing of a thematic (choroplets) map</b>						
Task: Making of a choroplets map Hungary – Map of the West Hungarian counties Argentina – Map of some districts of Buenos Aires	Correct categoriz.	Wrong categoriz.	Quality of work	Correct categoriz.	Wrong categoriz.	Quality of work
	434	112	High: 137 Ave.: 182 Low: 217 No ev: 31	1147	248	High: 1075 Ave.: 214 Low: 104 No eval: 3
	No answer: 21			No answer: 138		



The results of the 2<sup>nd</sup> question are also similar to the Hungarian one: in Argentina the number of erroneous answers was very high too (65.7%), but the major part of them had only one or two errors

The answers given to the 3<sup>rd</sup> and 4<sup>th</sup> questions had better results than the answers to the first two questions. Although there were a relatively high number of blank answers reading the information represented in a column of the diagram, the number of wrong answers was low and more than 66% of participants gave correct answers to this part of the question. In the second part, the pupils were asked to read information from choropleths, and the result was satisfactory (73.2% correct answers).

The results obtained in the 4<sup>th</sup> question can be considered satisfactory. From the total of answers, 449 (79%) were made in colour and only 102 (18%) in black and white. This result emphasizes our opinion about the interest manifested by the pupils in this kind of graphical and creative activities.

## Afterword

People interested in this topic can find free access to all the databases, documents, etc related to this project visiting the following site: <http://lazarus.elte.hu/hun/dolgozo/jesus/mag-arg/proyect1.htm>. All the documents are in two languages of the participant countries (Spanish and Hungarian), but we plan to translate the databases and final documents into English, too.

In September of 2005, the organizers sent to all the participating schools the results achieved during this survey. In 2006 we prepared a document presenting and analysing the results of the survey. This report summed up the positive experiences detected during the teaching and practical use of map concepts, drawing up those ideas and suggestions that could be applied mutually in both countries. We sent this final document to Argentine and Hungarian institutions related to educational activities in the fields of geography and cartography (ministries, research institutes, teachers' organizations, etc).

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