

# Experimenting an Alternative Method of Representation in School Cartography

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In 2005 and 2006, Argentine and Hungarian researchers on School Cartography organized a survey to collect information about the use and understanding of thematic maps by pupils in their respective countries. After the analysis of the obtained results, one of the proposals made by them was the study of alternative methods of thematic representation to increase the pupils' interest in the use of thematic maps and to make easier and clearer the reading of data represented on these maps.

During the next years (2008-2009) a new research project was begun on Chernoff faces, a method to represent multivariate data created by Prof. Hermann Chernoff (Professor Emeritus of Applied Mathematics, Department of Statistics at Harvard University) in 1973. The essence of his method is to use a human face as a symbol (called multivariate symbol), on which its features (eyes, ear, nose, mouth etc.) can be used to represent different variables, changing the specific characteristics of each feature depending on the values of these variables.

First theoretical research was developed about this method and its use in thematic cartography beginning from the 1970's. Chernoff proposed a method for the graphic representation of statistical data using a human face, but the characteristics of this method need to be adapted to the cartographic requirements before using it on a map. The main interest in our research was to study the possibilities of the method in School Cartography, so our research team developed studies to make the face easy to be read by pupils from Elementary and Secondary Schools. Our aims were not only limited to the use of the method itself, but also how the principle created by Chernoff can be applied in map symbols (first of all in pictograms), improving the use of these symbols to represent more data without making their reading more difficult. Following the Chernoff principle, a pictogram (or a geometric symbol) can be divided into more relevant and graphically better recognizable elements, and each of these elements can represent a specific variable (data set).

To test the theoretical results, participating researchers made two questionnaires that were filled by Argentine and Hungarian pupils. After the analysis of the results, they were resumed in some general proposals, but some questions still remained without a clear answer, e.g. using the Chernoff principle on pictograms the Hungarian pupils obtained the best result in the questionnaire, while the Argentine result was the second worse of their survey.

This situation motivated us to organize a new project with a new participant country (Austria) in 2010 and 2011. Based on the previous experiences, the theoretical aspects were revised with new ideas directed to improve the use of the method during the geovisualization of data. The results of the Austrian survey were compared with the results previously obtained by Argentine and Hungarian pupils in 2009, finding answers that helped us to clarify the contradictory results. At same time, a new Hungarian questionnaire was applied in early grades (grades 3 to 5) of an Elementary School in Budapest. This test filled the gap left during the 2009 survey, studying how younger children can read

the data represented using Chernoff faces, pictograms modified according to the Chernoff principle and a traditional method of thematic representation. This Hungarian survey let us determine the grade of acceptance of these alternative methods between the younger pupils.

Based on these experiences, conclusions and recommendations were worked out about the possibilities of using the Chernoff faces and the Chernoff principle for map symbols in School Cartography, specifically in School Atlases made for the early grades of Elementary Schools and other materials related to the geographical education. All the databases, results of analysis, conclusions and proposals written by the participant specialists in these projects can be downloaded on the Web.

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