Cognitive Mapping of Major World Regions among Czech Geography Students

FILIP POLONSKÝ and JOSEF NOVOTNÝ

Department of Social Geography, Faculty of Science Charles University Prague, Albertov 12843, Czech Republic; filip78@gmail.com.

Secondary Author(s): Jakub Lysák, Department of Applied Geoinformatics and Cartography, Faculty of Science Charles University Prague, Albertov 12843, Czech Republic.

Abstract

World regions are essential categories through which our knowledge about the world is organized and spatially anchored. To a large extent, these regions are mental constructs created by considering selected features and by disregarding others. In this study we examine the world regional divisions in the minds of 107 Czech geography students at the Charles University in Prague which is additionally compared with the world regional division determined by the review of geographic literature (available in the Czech Republic) dealing with global scale issues. The results are shown in two maps. Map 1 (1:200,000,000) was created by georeferencing and superimposing respondents' sketch map drawings and Map 2 then using the method of borderline-strength analysis.

1.   Introduction

In their interesting book Lewis and Wigen (1997) critically examined "the myth of continents" when discussing the nature and practical significance of different ways in which we are used to divide the world into major regions. They showed that it is hardly possible to think, talk, and write about the world without keeping some sort of its spatial division in mind. Major world regions are essential categories through which our knowledge about the world is organized.

Several different approaches to global "macro-regionalization" exist. Conventional categories of continents are purposefully combined with other global categories based on shared historical experiences and common socio-cultural characteristics as well as with global political and economic divisions (see e.g. Hampl, 2009). In addition to many context-specific approaches, we are also interested as to whether a "complex socio-geographical world regions scheme" can be found that would be appropriate for teaching world regional geography as well as for several other organizational purposes.

Obviously, categorising the world into a few spatial units masks geographical complexity within these units and generates common identities ascribed to their inhabitants. To a large extent, major world regions are mental constructs created by considering selected features while disregarding others. For the large part, the images of the world are derived from education (and the media) rather than from personal experience. They are matter of memory and presentation and representation rather than own perception (Saarinen, 1987; Battersby and Montello, 2009). As such, there is also a tradition of cognitive mapping at a global scale that is typically concerned with the assessment of the personal skills and knowledge of different features of the globe, i.e. continents, states or other important elements (Saarinen and Maccabe, 1995; Wiegand, 1998).

In this study we focus upon the cognitive knowledge of world regions among the Czech geography students and on how it differs from world regions defined on the basis of predominant divisions of world regions as delimited in recent geographical literature. Students were instructed to consider their own regionalization that would be appropriate for the organization of a course on world regional geography. This comprised the drawing of 'their' regions in two map templates (so-called sketch maps). Two final global maps were then created by combining the data from both tasks.
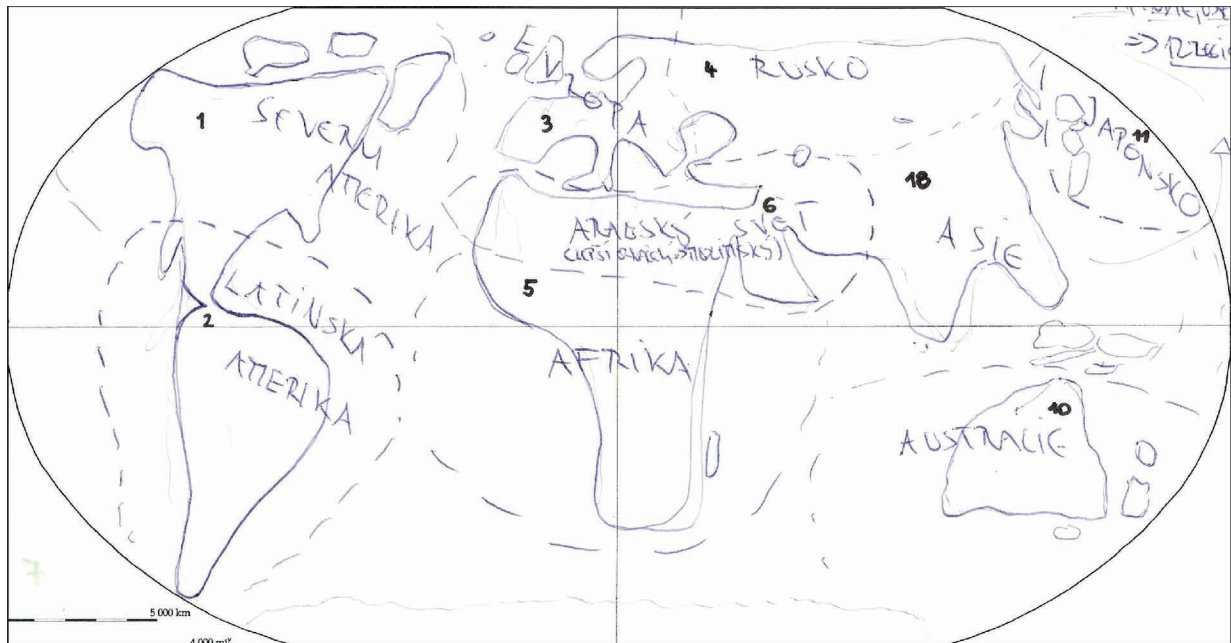
2. Methods

The analysis consisted of three steps including (1) the collection of students' sketch map drawings, (2) their processing and superimposition, and (3) the design of final maps. Each step is described separately for the two tasks (see below).

Respondents were 3rd - 5th year students of human geography (social geography and regional development and education in geography) at Charles University in Prague. As geography students, they already had some experience with drawing sketch maps (e.g. from cartography lessons), and had already had some information from earlier lectures on world regional geography. As already mentioned, they were asked to consider their own regionalization of the world that would be appropriate for the organization of a course on world regional geography. They were also instructed that the number of major world regions should range between 9-15 units (1.5n - 2.5n; n = 6, 'n' here represents 6 'conventional' continents, excluding Antarctica).
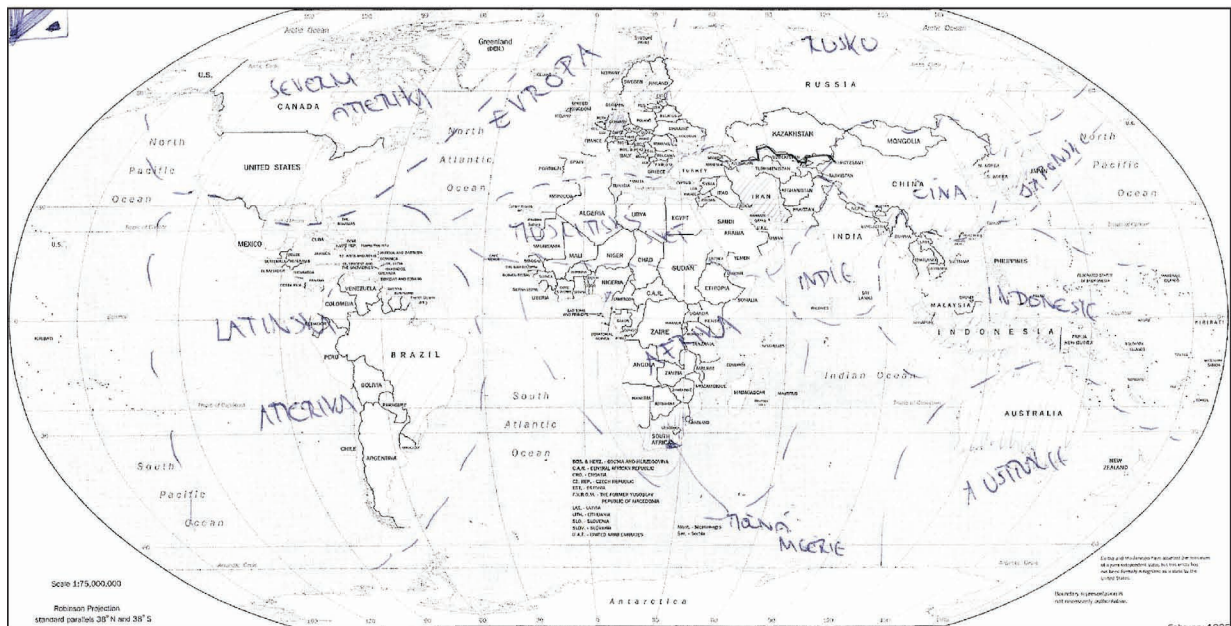
Then they had to draw lines of continents and boundaries of 'their' major world regions onto a blank map of the world with the equator and first meridian already marked (e.g. Figure 1a). As the respondents were instructed, the emphasis was laid not so much on drawing detailed shapes, but on drawing units in their correct position and with an approximate areal extent.

The blank template of the world map used the Robinson projection as this projection is more appropriate than traditional cylindrical projections. As it is not an equal-area projection it exaggerates areas towards poles, although less so than some other commonly used projections such as those that are Mercator based. Moreover, the Robinson projection was chosen because it better represents the shapes of the Earth and could possibly impel the respondents to avoid overestimating some of the areas close to the top and bottom parts of the frame. For further discussion about the use of Mercator and Robinson projections and for some other interesting findings related to the application of these projections in cognitive mapping see Battersby and Montello (2009).

After completion of the first task, students were given the template of the global political map with limits and labels of sovereign states already imprinted. They were asked to draw the borders of major world regions into this map and to give names to the regions. Simultaneously, they had to identify and mark one 'core' country for each world region (e.g. Figure 1b). By a 'core' country, it was meant the country that has most influence upon a particular region, whether in terms of political, economic, or cultural influence. Throughout this task the respondents were shown different world maps screened in front of them, which depicted various aspects of global human geography such as population density, religious, and language structure, and the levels of economic development.

(a)

(b)

Figure 1. a, b - Examples of one student's sketch maps.

The second stage of our work involved integration and processing of data obtained from these drawings. This step firstly required the adjustment, scanning and vectorization of individual sketch maps from the first task; there were a final set of 107 usable sketch maps. Regional units delineated within each of the drawings were then coded accor-

n.	World region	n.	World region	n.	World region	n.	World region
1	North America	6	N Africa and SW Asia	11	Japan	16	Southwest Asia
2	Latin America	7	East Asia	12	Central America	17	Asia I (7+9)
3	Europe	8	South Asia	13	East-Central Europe	18	Asia II (7+8+9)
4	Russia and "neighbours"	9	Southeast Asia	14	Central Asia	19	Asia III (8+9)
5	Sub-Saharan Africa	10	Australia and Oceania	15	North Africa	20	Southern Africa

Table 1. Coding of world regions for the purposes of subsequent analysis.

ding to the coding classification shown in Table 1 (regions 1 - 20). These sketch maps were scanned into digital image files so that they could be vectorized in the graphics environment of ArcGIS 9.1. Each unit was saved as a polygon and assigned by code according to the classification in Table 1 (in the case of fragmented regions, the same code was given to all its parts). The adjusted figures were then ready for the final automated georeferencing procedure.

In this procedure polygons were converted to rasters with cell sizes of about 50 km (0.025 cm in the map). For the superposition method, each raster was assigned a unique value determined by: (1) its position within the template and (2) its pertinence to regions 1 - 20 (as in Table 1). The rasters of the same position within each of 107 analyzed drawings were then superimposed one on another so that the *intensity* of occurrence of particular regions (1-20) for individual raster positions could be determined. In this way, an initial map showing the intensities of occurrence of regions was created (not shown in here).

In order to simplify this map and make it more readable, some generalizations were necessary that would reduce the number of regions displayed. This was made by splicing or leaving out less frequent regions: Central Europe (n. 13 in Table 1) was combined with Europe (3), Central Asia (14) with the 'Russian' region (4), Central America (12) with Latin America (2), South Africa (20) with Sub-Saharan Africa (5), Japan (11) with East Asia (7), North Africa (15) was merged with Southwest Asia (16) into North Africa and SW Asia (6), while Asia I, II, III (17, 18, 19) were excluded completely from examination. As such, the set of 10 most prevalent world regions (1-10 in Table 1) were identified. The raster intensities for these regions are displayed using colour-scale categories in final Map 1 (1:200,000,000).

For comparison with a benchmark, Map 1 additionally shows the borders of world regions determined using the borderline-strength method on the basis of literature dealing with world regional schemes (Figure 2). The materials used for the determination of the borders include 20 textbooks and papers (published after 1990 and accessible to the Czech geography students through the university library or available online). With some exceptions, this scheme corresponds to the scheme used by Lewis and Wigen (1997, p. 168). For more information including the explanation of the method see notes

appended to Figure 2 and the previous study by Polonský (2008) where the complete list of references can be found.
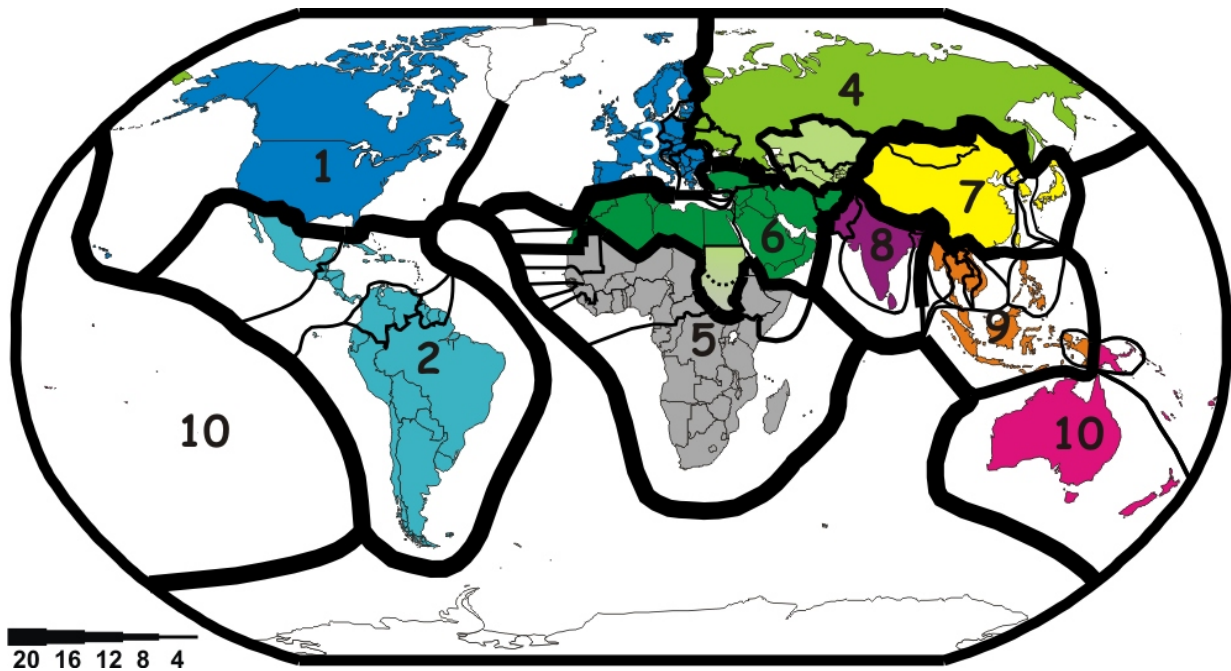

Figure 2. Predominant divisions of major world regions determined on the basis of a literature review (20 relevant geographic textbooks and papers dealing with global scale issues accessible to Czech geography students). Notes: the thickness of borderline in particular segment of (country's) limit corresponds to numbers of authors that delimited it in this segment; list of world regions: 1- North America, 2 - Latin America, 3 - Europe, 4 - Russia and 'neighbours', 5 - Sub-Saharan Africa, 6 - North Africa and Southwest Asia, 7 - East Asia, 8 - South Asia, 9 - Southeast Asia, 10 - Australia and Oceania.

In addition, the prevailing picture of mental representation of world regions by the Czech geography students was obtained by the use of borderline-strength method. This is shown in Map 2, where the strengths of particular border segments were determined according to the relative frequency of their occurrence in the respondents' drawings from the second task (Figure 1b). Map 2 also displays the 'core' countries marked by the black four-pointed and white-edged star symbols. The size of particular symbols corresponds to the frequency with which the respondents labelled respective core states. The chain-dotted lines were used for borders transgressing the lines of sovereign states. Moreover, the benchmark in terms of the major world regions determined on the basis of the literature (Figure 2) is also displayed in Map 2 by different black hues.

3.   Concluding remarks

The most usual way of describing, presenting, and representing the world in its whole is through the world map (or the globe). At the same time, the partitioning of the world

map into major regions provides an elemental organizational basis in which the knowledge about the world is accommodated. The main goal of this work has been to present maps showing the perception of major world regions by Czech geography students. The maps were created by georeferencing and superimposing students' sketch drawings (Map 1) and using the borderline-strength method (Map 2). The students' views have also been contrasted with the prevailing world regionalization based on the review of selected textbooks and papers dealing with global scale issues.

Although space limitations do not allow for a thorough discussion of the results, a few brief comments on the findings are presented. Generally, our maps indicate that students' perception and drawing skills coincide relatively well with the 'synthetic' scheme derived from the literature. However, some common biases can be identified. For example, the visual inspection of Map 1 suggests that students tend to draw North America and South (Latin) America longitudinally in the same position (this corresponds to findings of Tversky, 1981; Wiegand, 1998), Africa is shifted more to the south and west and Australia appears more to the south (see Map 1).

Regarding Map 2, some examples of interesting findings include Pakistan mostly incorporated into North Africa and Southwest Asia, the 'shift' of the usual border between North and Sub-Saharan Africa more to the south and the transitional character of Central Asia and East-Central Europe (see Polonský, 2008).

These examples of our findings, as well as other results presented in our maps, may provide a vital basis for extensive discussion of geopolitical and cultural implications of world macro-regionalization. The positional and areal extent biases may be quantified more rigorously using our georeferenced data (moreover if the equidistant projection is used distances between particular units might analogously be assessed). In addition, the described methods of assessing students freehand sketch map drawings of the world can be further utilized for educational purposes.

Software

ESRI ArcGIS 9.1 was used for the data integration in terms of the vectorization and superposition of drawings. Command line scripts for ArcGIS were generated and used for the automatic processing of our data. Corel Draw X3 was then used for final design of the maps.

Acknowledgements

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