

TRAINING SCHOOL ON CARTOGRAPHY AND GIS IN BULGARIA

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Presented at the Joint ICA Commissions Seminar on "Internet-based Cartographic Teaching and Learning: Atlases, Map Use and Visual Analytics", held in Madrid (Spain), July 6–8, 2005

Introduction

The training school on cartography and GIS is proposed by author. The aim is to promote the interest in cartography and GIS by lessons on geography at high school and approve the cartographic culture of students. The teachers need such education because of very fast development of technology and information science. Their new knowledge about present and future conditions in these fields will keep them in good level as teachers. The Ministry of education needs such school because it responses to their National Strategy for education. The national presentation of the school could be a base for its geographically pervasion in the Balkan region or in Europe.

Need of School on Cartography and GIS

The need of Training school on cartography and GIS were growing up in the last years because of some reasons:

- The Ministry of Education and Science has a National Strategy for Introduction of Information and Communication Technologies in Bulgarian Schools.
- The knowledge about Information technologies of teachers in geography is very often less than ones of students.
- The curriculum in geography includes the knowledge about GIS that could be received not only by teachers' lectures but also by necessary training lessons.

The training school is a good possibility to fill some lack of knowledge, training and modern usage of cartography in geography lessons in Bulgarian Schools.

Lessons themes of the school

The themes presented in the school are the following:

- Electronic Atlases in Bulgaria and in abroad - Internet atlases, electronic atlases produced in Bulgaria:
 - training with electronic atlas;
 - tasks for students: definition, realization, and results.
- GIS - definitions, database, levels of processing; examples of GIS projects.
- Work on GIS - map projection: definition of their parameters according the territory location, scale and theme of the maps. How to develop the sphere to the plane: from no developed surface to developable surfaces and plane.
- Cartographic methods in map visualization and their use in the school atlases. Some mistakes of geographic representation and cartographic methods - examples from Bulgarian and foreign atlases and textbooks. How to choose the best atlas for given purposes and their analyses?
- Topographic maps: training works on topographic maps; comparing of traditional Bulgarian topographic maps with new ones on NATO standards. Examples from GIS military projects.
- International Cartographic Association (ICA) - mission, vision, and strategy: aims and tasks. Bulgaria - a member of ICA.
- Bulgarian participation of Barbara Petchenik Competitions: traditions and results - how to draw a map of the world under given title and some conditions; how to win in the competition?
- Internet sources for cartography and geography presentations. 3D maps: definition, examples of use, map elements, designing, using.

Sources for School Organization and Realisation

The realization of the training school will be done by activities of the software companies as ESRI Bulgaria, private companies as DataMap-Europe, producer of electronic Bulgarian atlas. The lectures will be prepared by professors from

the Universities in Bulgaria responsible for cartographic education - University of Architecture, Civil Engineering and Geodesy and Sofia University "St. Kliment Ohridski" and Bulgarian Academy of Science.

The activities of different ICA commissions and their experiences in this field will be presented to teachers in geography. Erasmus teachers mobility programs between ICA members could achieve this aim too.

Organization of the School will be done by the Department of Information and In-Service Training of Teachers at Sofia University "St. Kliment Ohridski".

Thematic developments and details in some topics

The program for the school on cartography and GIS is developed on the base of geography curriculum. The topics are chosen if they are connected with cartography and GIS. Other aim is to achieve some results, which are requested by the National Strategy for computerization of Bulgarian schools approved by Ministry of Education (see <http://www.minedu.government.bg>).

Mapping and cartographic products in all their existing forms in Bulgarian and world market will link the cartography and GIS in the School. The children competition in National and International level will be commented in the direction to achieve link between student perceptions, understanding of geography and teachers as providers of knowledge.

Some of topics and their detailed program will be discussed below on the base of existing materials, lectures and appropriate tasks for teachers and students.

Electronic atlases

After short introduction about electronic atlases development in the world, the attention could be directed to Bulgarian version of such atlas, called "MaxInfo", product of Datamap-Europe Ltd. It consists a lot of information about Bulgaria, Sofia and other Bulgarian cities: maps, legend, photos and texts (see Figure 1). This information could be visualized in computer screen and printed. Teachers and students could include the necessary objects by interactively chosen symbols and automatically situate them on the base map. The students can search the necessary information by requests and situated or see it in pictorial and/or text form. On this way they get knowledge about GIS function in the first step of their education. The Atlas is working in user-friendly way, so the students will begin to use GIS questions and will understand the productivity and usefulness of really GIS (see [Bandrova, T., 2001] and [www.datamap-bg.com]).

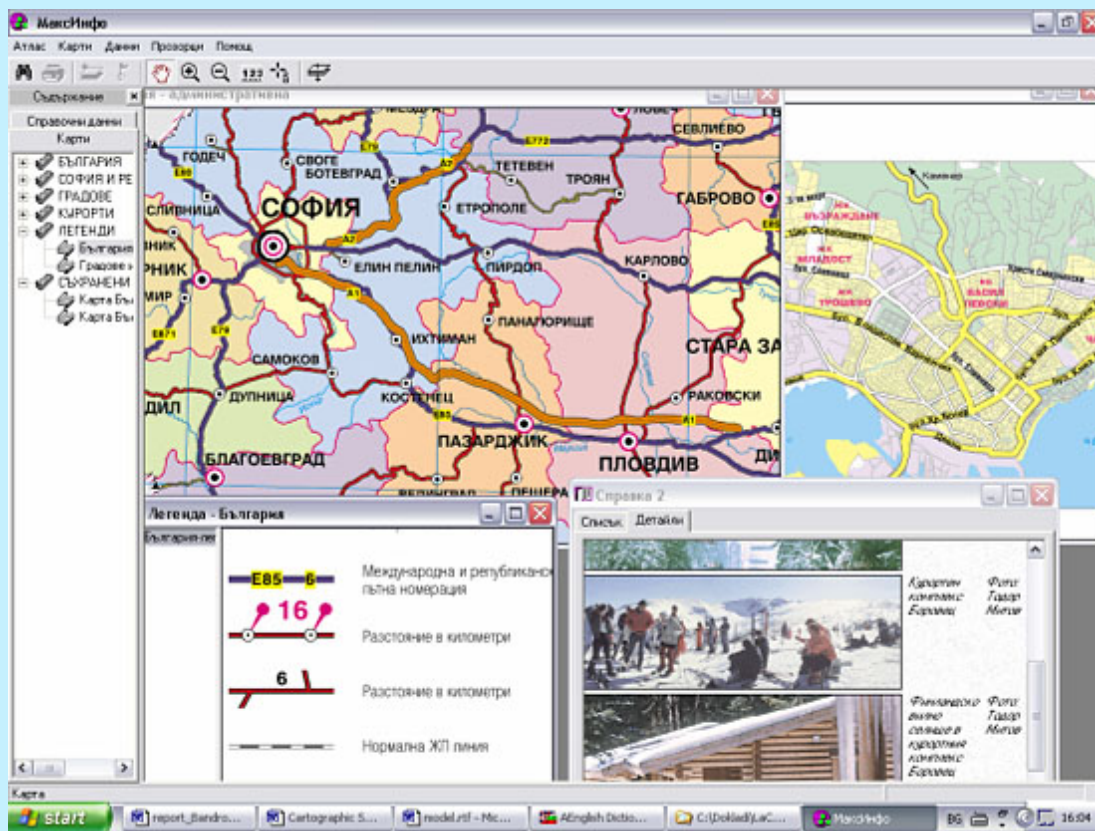


Figure 1: A possibility of electronic atlas for data combining and use

The training with electronic atlas could be directed in 3 points:

- **Work with data.** Different kind of tasks can be given to students. They can select a list of type objects, classify objects, examine some details of every object and connect them with information for other objects. It is flexible system for object searching according different criteria - name, type, address, key words and others. Every reference can be saved for future usage.
- **Work with maps.** There is a possibility for scaling maps, move map images, switch on or off the visibility of layers, choose a symbol system for object mapping.
- **Work with data and maps.** Students can add data on a map as a separate map layer, receive information for objects, find the object situation from a data list, etc. Examples of teachers tasks can be the following according to [Ormeling F., 1996]:
 - "What is on a map (identifying);
 - What is whereon the map (classifying);
 - Do you see a relationship on the map (relating);
 - Check if this relationship is valid for each region on the map (checking, monitoring, validating)".

Work on GIS - Map Projection

This topic is included in the curriculum on geography for 8 years of student education (15-16 years old). There are one or two lessons that give the base theory of map projection. Two pages with explanations and examples of map projections are included also in Atlas on geography for this year of education. This is one of the most difficult topics for understanding because of strong mathematical and geometrical base.

The School proposes to teacher working with GIS for easy understanding of parameters definitions of projections and their changing for different purposes, scales and territory. For example a new Bulgarian Geodetic Co-ordinate System (BGS) 2000 is proposed for mapping of all territory of Bulgaria. It is Lambert Conformal conic projection with two standard parallels. The parameters of the projection (see [Bochev, T., 2003]) are the following:

$$\varphi_N = 43^{\circ}28'35''.8786$$

$$\varphi_o = 42^{\circ}40'00''.0000$$

$$\varphi_S = 41^{\circ}51'11''.2153$$

$$\lambda_o = 25^{\circ}30'00''$$

Knowing the parameters of the projection, teachers could define it using GIS, for example by Arc View (see Figure 2). Also they could make some experiments with different projection suitable for designing of map of the world. Their standard alternative is between Behmann, Equal-Area Cylindrical, Geographic, Hammer-Aitoff, Mercator, Miller Cylindrical, Molweide, Peters, Plate Carree, Robinson and Sinosoidal projections. The training with map projection will clear also the questions about conformal and equal-area projections.

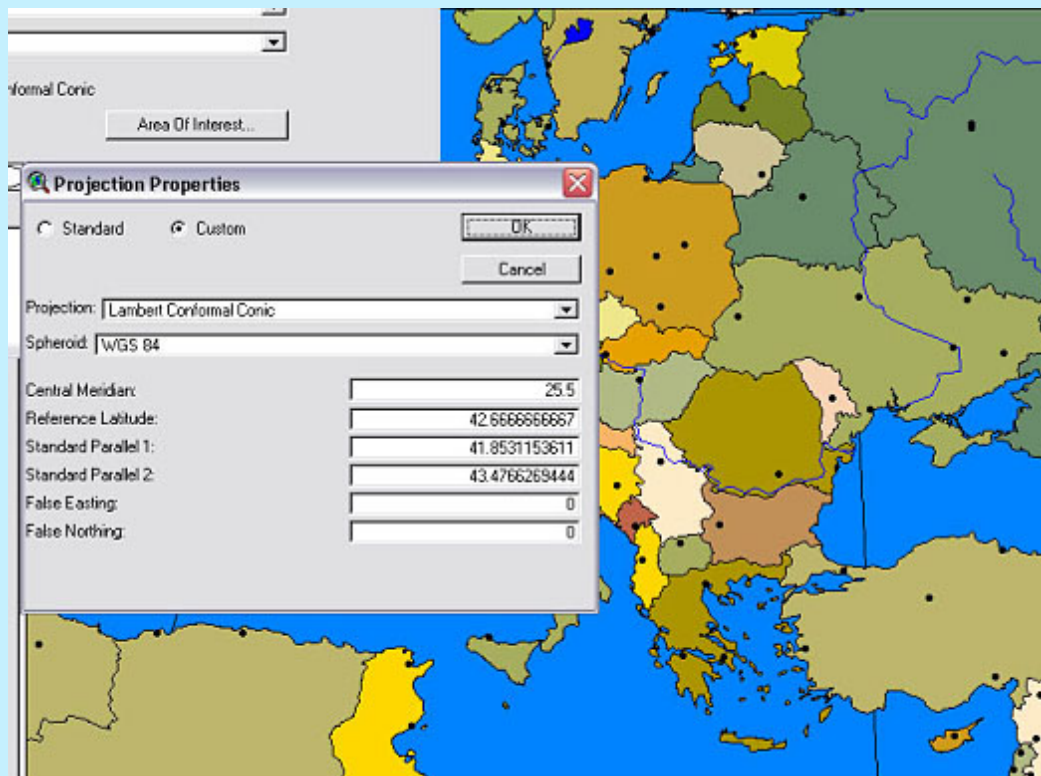


Figure 2: Definition of parameters for BGS 2000

Other subtopic in this theme is the development of the sphere on the plane or on the developable surfaces as cone and cylinder. Different kinds of deformations are appeared (area, linear or angular) as a consequence of this transformation. This is visible in the map-play included as a separate part of the Atlas on geography - puzzle or icosahedron (volumetric map of the world with 20 equal triangular faces). The play with them is multifunctional in geographical, cartographical and mathematical aspects (see Figure 3).



Figure 3: Map puzzle is used in lessons on map projection and deformations

Bulgarian participation of Barbara Petchenik Competitions

Four National competitions were organized for Bulgarian participation at International Exhibitions. National media as radio, newspapers, Internet pages, etc. advertised the National competitions. The children map competition has multiple profits. One of them is for provocation of students' creative representation of the world under theme and clear indicated rules. They begin to understand that maps are design and drawn element by element and the objects and phenomena location is connected with their quality and quantity representation. All this theoretical aspect of map creation is not clear for them but the students use it for better drawing of their pictures. The teacher's role is very important during all process of the competition. He or she should direct the all process of the competition in the following steps:

- Idea of the competition;
- Information about previous competition and clear rules indications;
- Connections between common competition title and map title of every student;
- Choosing of cartographic base suitable for the title;
- Way of mapping and presentation of thematic contents;
- Design and art presentation of the drawing.

Some examples available in Internet space could be used for comments in every one of above-mentioned steps. The map elements as title, legend, scale, projection, and visualization are available in students' brain for the first time. The complexity and difficulty of map creation is understandable by children and teachers. Even blank maps do not put in the table so many questions as this competition. If the teachers are clearly familiar of the competition's rules and aims, they will use it in geography and cartography lessons. Some of results as winners-drawings could be seen in Figure 4.



Figure 4: Some examples from the IV National competition "Many nations - one world"

Conclusions and directions for future works

The National school on Cartography and GIS is included in the program of the Ministry of Education for qualification of teachers on geography. It will be organized 1 or 2 times per year for Bulgaria, depending of teachers needs. It could be developed in some directions:

- **Regional aspect:** the school could be proposed for a common project of Balkan countries or wider region of Europe. The interest will be grown if the program is changed and cover the subject included in school curriculum of all countries. Lecturers could be exchanged in the mobility principle;
- **Modernization:** including of more realistic presentation as cartographic animation and multimedia cartography for teachers lessons;
- **Variations:** The school could be developed under different themes according school years and school orientation - humanitarian, mathematical, language, technical and other kind of schools.

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