PRODUCTION OF DIGITAL SCHOOL ATLAS USING GEOGRAPHIC INFORMAION SYSTEM

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Summary: *Geoinformatics represented by its most powerful technology - Geographic Information Systems (GIS) has become an important part of many disciplines and cuts across all areas of modern information society. The article presents some aspects of the GIS integration in secondary school education in Republic of Moldova. Also there is presented general procedure of thematic map production using GIS as the main component of digital geographic atlases.*

Keywords*: geoinformatics, geographical information systems, digital school atlas on geography, didactic functions, geoinformation technology in education.*

Introduction

Nowadays teachers of geography use maps from different internet websites. In Europe is created web application www.toporopa.eu, which helps to verify students' geography knowledge. In Switzerland is created the database with statistic data, which is successfully used in secondary school. In Russia there are many software used during Geography lesson: GeoDart Game, Tripline Service, Learning Apps. In Kazakhstan the Digital atlas for Secondary Geography Education was created in 2015, and now is successfully used in schools [1]. In Republic of Moldova the paper geography atlases are used only. These atlases consist of thematic maps, according to Curriculum and represents geospatial data printed. That's why it is considered necessity to develop database for future digital school atlases.

The digital atlas for geography education will allow students to use GIS technologies during lesson at school. It provides geospatial analyse of data, creation of their own thematic maps and work with different kinds of contour maps [2]. Also it is useful for analysis of the thematic maps of the same area. For example, if the geographical problem is to observe regularities of climate and terrain, or of climate and vegetation [3], it is hard to understand using traditional paper atlases, because the maps are placed on the different pages. But in the Digital atlas these thematic layers are collected in one single layout, and could be combined and analysed.

Teacher may use the digital atlas on white board, to resize maps, to pan, to zoom in or to zoom out, to colour some objects by different colours, to select some areas, to add or to hide some geographical elements, to create geospatial tests for students. Student can search geographical objects on digital maps using different ArcTools, measure distances on digital map, colour digital contour maps, to analyse statistics data from different sources, create thematic map using geospatial analyse, to save digital map, to export it like a image, to print [4].

The modern technology of creation of digital maps allows the geospatial data collection by scanning of different cartographic materials, digitization of contour lines automatically or by operator, data analysis, data storage, transformation of the geographic coordinates into an X(Northing) and Y(Easting) coordinate system, attach a picture or any other media content, create a base map with general information such as hydrological system and settlements, add thematic layer to base map, import shape files, orthophoto [5]. Map symbols used could be drawings, lines, letters, shortened words or coloured areas. Some of them could be created in vector or raster graphics editor and imported in ArcGIS.

General procedure of Digital School Atlas production using GIS

There are presented the necessary documents, which formed the principals of preparatory work: catalogue of maps, document with short map description and methods of mapping, atlas layouts [6]. In Figure 1 with white color there are presented the main steps of the Atlas creating

process, which do not need any software to be used. With pink there is presented work process in Adobe Illustrator. And processes of maps creation in ArcGIS software is colored with green.
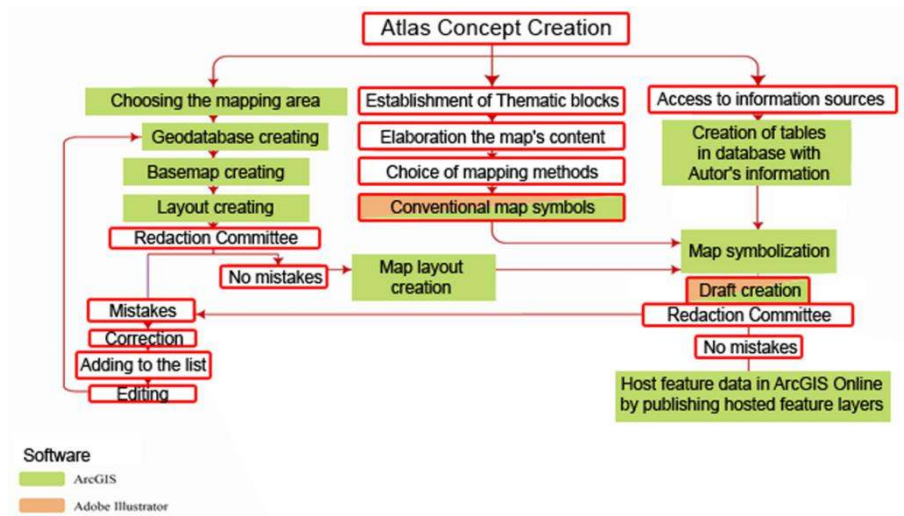

Figure 1. General procedure of Digital School Atlas production

Because of the important role of the Redaction Committee in Atlas creation, high priority is given to their work during all procedure of Digital School Atlas production (from the Atlas Concept Creation to the Data Hosting). First of all Thematic blocks of Atlas should be selected. After that every map's content should be elaborated and cartographers from the Redaction Committee should choose mapping methods for every geographical phenomena on every map from the future Atlas. After choosing the mapping area, geodatabase and layout development the base map should be printed accurately to be checked by Redaction Committee. If there are no mistakes, then Map Layout should be symbolized and rechecked by Redaction Committee again before the data hosting on ArcGIS Online.

Development of Thematic Map

ArcGIS Software provides contextual tools for mapping [7]. There is the thematic layer Average leakage non-colour, as you can see in Figure 2.
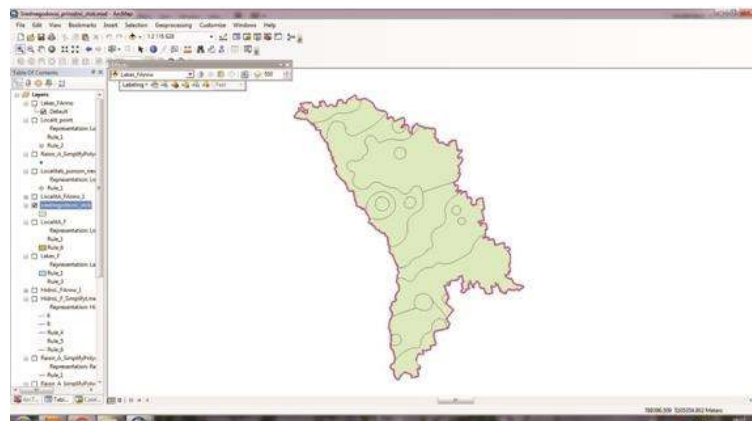

Figure 2. Average leakage non-colour

There is button Symbology in Properties of layer, which helps to colour objects by Categories. In the attributes table there is data about Average leakage levels in different parts of Moldova. So, as in you can see in Figure 3, we chose colours and fields in attributes table to colour this map.
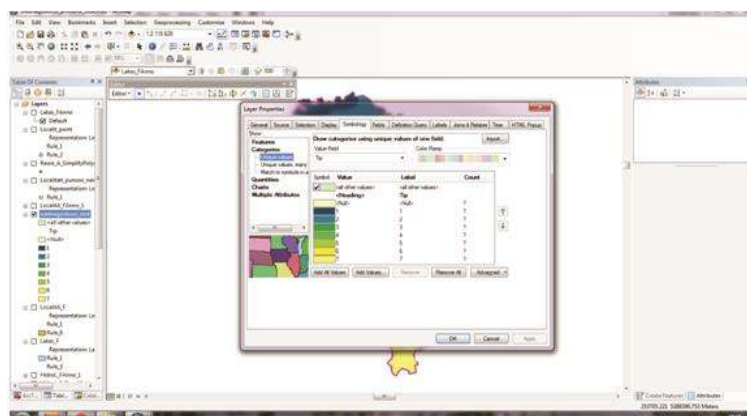
Figure 3. ArcGIS tool to colour Average leakage levels

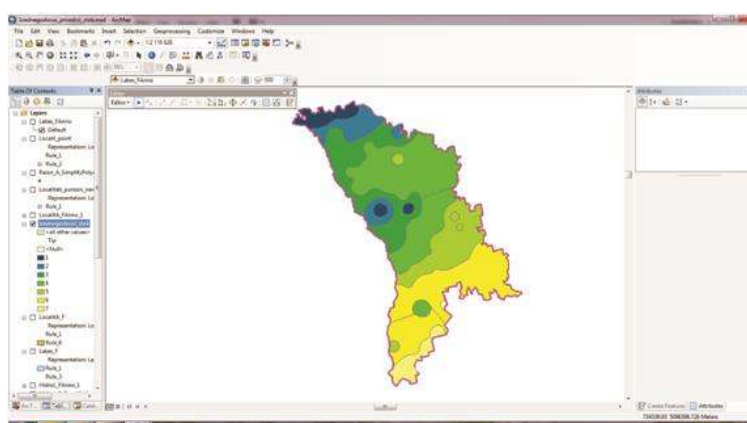In Figure 4 you can see the Result of Map Symbolizing by Categories.

Figure 4. Average leakage levels in Moldova

For better orientation, we need to add layers with Hydrological system and settlements of Moldova. Result is presented in Figure 5.
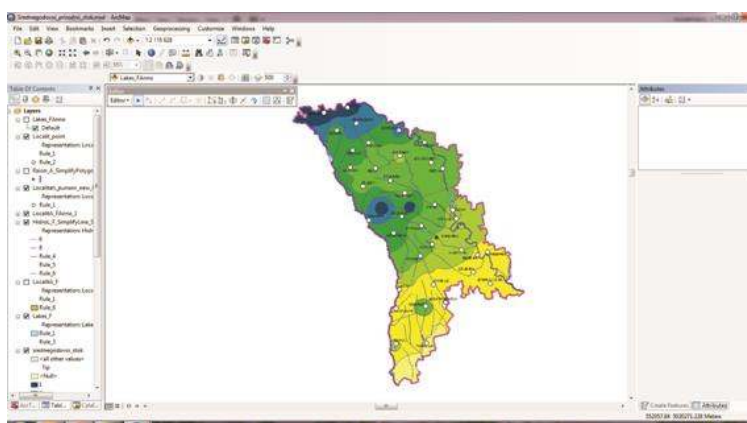

Figure 5. Average leakage map with Hydrological system and settlements

Conclusions

Digital school atlases may be a major component of technology-based education reform in Republic of Moldova because computers have become more accessible the demand for this technology has increased, leading to more frequent use of computer resources within school classes. In the near future, other objects, such as Geography, for example, will be studied in computer classes equipped with computers.

The role of the Redaction Committee in digital school atlas production is very important. That's why professional cartographers, GIS specialists and designers involved in this project will improve the quality of the final result. Also it is important that committee members should be of approximately equal rank and status in the organization to permit the free exchange of ideas.

Digital map is dynamic which means that it can be corrected anytime. The database will be updated automatically according to latest changes. Actuality is the main problem of paper atlases, which is easily solved in the case of electronic atlases.

Digital Geography Atlas in schools maybe increasingly effective as a tool of the practical learning process for a traditional face-to-face class, or an online course for home education for children with special needs or for popular Homeschooling.

Digital Geography Atlas should be tested to make sure that the application consistently works as intended before introduction to compulsory school curriculum. Also is strongly recommended to create Training and Methodical Support for Teacher of Geography to update traditional didactic methods.

References

1. DAMEKOVA S. *Electronic educational atlas on geography for schools of Kazakhstan* [online]. 2016, [accesat 29.02.2020]. Disponibil: https://research-journal.org/en/sate/electronic-educational-atlas-on-geography-for-schools-of-kazakhstan/
2. КИРЬЯК И., НАГОРНЯК С. Исследование методов создания тематических карт с использованием геоинформационных технологий. In: *Геоинформационный мониторинг окружающей среды gps и gis -технологии*, 2011, pp. 94-98.
3. СЫРОДОЕВ Г., КИРЬЯК И., СЫРОДОЕВ И. Опыт разработки экологического атласа бассейна реки на примере реки Днестр. In: *Национальные атласы в формировании глобального информационного пространства*, 2012, pp. 67-69.
4. КАЗАНЦЕВА О., МУЧИЛО М., СЫРОДОЕВ Г. Возможности и перспективы применения ГИС для атласного картографирования: опыт создания школьных атласов. In: *Націоналне картографування: стан, проблеми та перспективи, 2008, pp. 27-32*.
5. TERRY, A. *Thematic Cartography and Geovisualization*. Pearson Prentice Hall, 2009.
6. КИРЬЯК И., НАГОРНЯК С. Разработка технологической схемы создания и подготовки к изданию географических атласов. In: *Геоинформационный мониторинг окружающей среды gnss и gis -технологии*, 2013, 51 (4), pp. 45-48.
7. CHIRIAC, I. *Metodologia de întocmire a hărţilor tematice*: Thesis. Chisinau (Moldova): Tehnical University of Moldova, 2011.