РОЗДІЛ 1
МОДЕРНІЗАЦІЯ СТРУКТУРИ, ЗМІСТУ І МЕТОДИКИ ГЕОГРАФІЧНОЇ ОСВІТИ НА ЗАСАДАХ КОМПЕТЕНТНІСНОГО, ДІЯЛЬНІСНОГО ТА ІНДИВІДУАЛЬНОГО ПІДХОДУ ДО НАВЧАННЯ

GEOINFORMATION TRAINING MODELS AS A TOOL FOR THE MODERNIZATION OF GEOGRAPHIC EDUCATION

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Based on our previous works [1-4], it should be noted that geoinformation training models are a powerful tool for the modernization of geographic education, primarily during distance learning in war conditions. At the same time, the contentual typification of such models is very important, which significantly increases the effectiveness of their application. Under such conditions, geoinformation training models can be divided into the following principal types: general models, special models and combined models.

General geoinformation training models are single or combined digital cartographic models of all types and integrated graphic-sign geographic training models of certain types, such as schematic maps, value-by-area maps etc.

The first subtype of special geoinformation models includes models of rendering, i.e. complex building of three-dimensional images. Among them image Digital Elevation Models (*DEM*) dominate in the domain of geography training. The Digital Elevation Model is a digital image of a topographic surface created, firstly, using a raster elevation model in the form of a set of surface elevations at regular network points, considering that *DEM* at the same time is the *United States Geological Survey* standard. Secondly, such image can be created with the help of vector model *TIN*, i.e. the triangulated irregular network, which initially uses a mentioned elevation set at points of the irregular network ([2, 4]).

Special geoinformation models also includes 'draping' models. They are developed using the projecting plane digital layers on a three-dimensional image, usually *DEM*. These layers can be vector and raster thematic geographic maps, etc., resulting in three-dimensional presentation, which is optimal by visualization.

Models of kinematic animation or dynamic interactive visualization of three-dimensional images, being a subtype of special geoinformation models, are usually

also based on *DEM*. However, they simulate movement of 'viewers' (students or pupils) across a particular geographic terrain under study, with a possibility of stops in the required places of such virtual trip. Quite often, this terrain is simulated from a bird-eye view or an aircraft board, which regard to the so called 'interactive fly-around models'. Sometimes weather conditions, etc. are visualized in addition to enhance the presence effect of models.

The next subtype of special models is routing optimization models. Routing is a geoinformation model task for finding the most efficient route between nodes of a network. This route means the least-cost by resources, efforts, etc. distance between two points of a digital layer. Routing optimization models can be very useful in the process of geography training, in particular, for regional studies. For example, these models are used when determining optimal, from the point of view of training purposes, physical load of students or pupils and other factors of the route and the rules of movement along real geographic objects of study, including by motor transport, hiking or ecological trails, etc. Models are also useful for determination of such routes and trails. It is expedient to use mobile computer and position-navigating hardware-supporting training tools during the work with routing optimization training models directly in the field. Such approach can improve the direct use of available digital geographic training and research information and its storing.

Modern training and research geoinformation models are intended for formation and development of students' or pupils' creative abilities. Due to this use, specific features of geographic processes and phenomena or factors of environment state deterioration as a result of military operations etc. become available for monitoring, study and research.

A typical example of self-training models, as a subtype of special geoinformation models, is the *MAP* data raster model. This model is successfully applied worldwide ([2-4]) as a training tool in geoinformatics. It is effective for students or pupils to acquire expertise of computer-aided organizing of spatial databases.

Special geoinformation training models include also an electronic map that plays a special role among multimedia training tools. In addition, it is a component of appropriate electronic textbooks and manuals, electronic atlases, libraries, databases etc. The electronic map is a set of thematic digital layers of data and their visualization software with storage of this map (layers) on certain holders of information storage media, including information network storage media ([2, 4]). Visualization process means in the geoinformation terminology both projecting and generating of text, images, map images and other graphics more often on the monitor screen based on specific output digital data and regulations and algorithms of their exchange.

As a rule, students or pupils use not only separate electronic maps but also electronic atlases. The electronic atlas is a multimedia integrated information tool, stored on a holder of information storage medium. It contains a systematized set of electronic maps, developed according to the unified program and selected thematic scope, as well as other types of digital information and the necessary visualization software of the atlas.

The following models, not considered above, can be qualified as other special geoinformation training models. In particular, firstly, they are models of digital layers overlay contributing to development of students' or pupils' combinative skills. Secondly, they are models of information-network viewing of geospatial data, provided by Internet resources, primary by the cartographic web-services with two- and three-dimensional visualization of the Earth's surface and other sources of geospatial data, in particular ([1]):

– the *World Wind* program, which is managed by *NASA* (*abbr.* from the *National Aeronautics and Space Administration*, which is an agency of the US government). This program during its use requires the involvement of specialists in geoinformation technologies;

– the *Google Earth* project, the convenient interface of which is intended for an untrained user, allowing him to create even his own layers with a given classification and assigned attributes and the possibility of data exchange;

– the *Digital Earth* project, which develops an essential relational bases of global geospatial data, which are easily visualized and useful both for geographers and a wide range of other users;

– data of the Earth remote sensing related to the satellite program *Landsat*, which is managed by *NASA* and the *USGS* (*abbr.* from the *United States Geological Survey* – a government research institution in the scope of Earth sciences);

– collections or atlases of basic and thematic geographic information, presented in the form of maps, digital layers, etc. (for example, *ArcGIS Living Atlas of the World*,), sometimes combined with data in a global network in a specified manner;

– interactive raster land cover map of the *Climate Change Initiative* program (CCI-LC Map) developed by the *European Space Agency* (*ESA*);

– interactive raster land cover map of the *GlobeLand30* cartographic web-service operating by the *National Geomatics Center of China* (*NGCC*), etc.

Combined geoinformation training models, as the third type, integrate useful visual and training properties of general and special geoinformation models. The most interesting examples of such integration are:

– models of general digital maps of points and contour lines and special image *DEM* in the form of a digital block diagram with a given viewing angle;

– models of a general digital map of a topographic surface presented in contour lines with *DEM* image.

Modern geoinformation training models have a huge potential for the progressive improvement of geographic education in Ukraine on the basis of its global interoperability.

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GEOGRAPHICAL PRACTICES IN THE FOCUS OF THE COLLABORATION OF THE POLTAVA V. G. KOROLENKO NATIONAL PEDAGOGICAL UNIVERSITY AND THE UNIVERSITY COLLEGE OF COPENHAGEN

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Geographic practices are an integral element of student learning. At the Poltava National Pedagogical University named after V. G. Korolenko, educational field practices are especially relevant for the preparation of students under the educational and professional program «Secondary Education (Geography)». They are necessary in the preparation of future geography teachers and specialists in local history and tourism activities, as they are aimed at forming students' local knowledge competence, the ability to apply theoretical knowledge in practical work, form a scientific worldview, develop creative thinking, teamwork, initiative.

Extensive experience in organizing and conducting educational practices at the Poltava V. G. Korolenko National Pedagogical University became a component of the project of international credit mobility under the Erasmus + EU program for education with the University College of Copenhagen (Denmark). The exchange of experience between teachers of educational institutions was implemented in 2019 together with students of Poltava University.

Recommendations on the organization and conduct of educational practices for geographer students were provided by O. Baranovska, M. Baranovskyi, M. Biletskyi, K. Borysenko, S. Bortnyk, L. Bulava, I. Wanda, O. Danylchenko, O. Kovtonyuk, A. Cornus, O. Cornus, L. Kotyk, T. Lavruk, B. Neshataev, O. Pidkova, M. Proskurniak, N. Stetsyuk, V. Smal, I. Smal, S. Syutkin, D. Kholyavchuk, T. Shovkun. The applied aspects of geographical educational practices of *Ivan Franko National University* of *Lviv* [1], *Sumy State Pedagogical University A. S. Makarenko* [1; 4], Yuri Fedkovich Chernivtsi National University [3], *Taras Shevchenko National University* of *Kyiv* [5] and other higher education institutions of Ukraine should be especially noted.

Educational comprehensive local history and geography field practice for students is aimed at practicing the skills of researching natural and socio-economic objects in the field, namely, studying the regularities of physical and geographical objects and processes in mountain landscapes and the territorial organization of the population and economy of the Carpathian region Practice is a logical continuation of