

Tetiana NAZARENKO^a, Oleh TOPUZOV^b, Olena CHASNIKOVA^c, Iryna DUBROVINA^{d1}

^aNational Academy of Pedagogical Sciences
of Ukraine

e-mail: geohim@ukr.net

ORCID: 0000-0001-7354-5245

^bNational Academy of Pedagogical Sciences
of Ukraine

e-mail: proftop@ukr.net

ORCID: 0000-0001-7690-1663

^cNational Academy of Pedagogical Sciences
of Ukraine

e-mail: maxlen123@gmail.com

ORCID: 0000-0002-8535-6668

^dNational Pedagogical Dragomanov University,
Ukraine

e-mail: eduard_netcorps@yahoo.ca,

Iradubrovina@ukr.net

ORCID: 0000-0002-6676-4789

ROLE OF GEOGRAPHY TEACHER IN FORMING THE PUPILS' CARTOGRAPHIC COMPETENCE

Rola nauczyciela geografii w kształtowaniu kompetencji kartograficznych uczniów

Abstract: Cartographic competence has been determined as a very important one in the list of subject geographical competencies recorded in the State Standard of Secondary Basic Education of Ukraine. Since a geographic map is a system of landmarks with specific information based on field studies, aerial photographs and satellite images, and other cartographic sources, statistics and literature, the task of a geography teacher is to instil in pupils the necessary skills, which will result in cartographic competencies. Since it is impossible to study geography without a geographic map as a forming factor for spatial thinking, the authors of the article conducted an empirical research. The research and comparative analysis were conducted among the pupils, their parents and geography teachers in order to identify their cartographic knowledge, concepts and cartographic skills of the pupils.

The aim of the article was to determine the role of the geography teacher as a consultant who forms the cartographic competence, the content of which consists of cartographic knowledge and map reading skills. The objectives of the paper includes evaluation of the pupils' levels of cartographic competence, and determination of the correlation between the levels of the pupils' cartographic competence and factors influencing its development.

The theoretical analysis and empirical study resulted in developing the updated methodology for working with the maps on geography classes, and determining the role of a teacher who guarantees the formation of subject competence in cartography among pupils with the use of proper and relevant methodological instruments for teaching pupils' cartographic competence. The results of the correlations that we received highlighted the important role of a geography teacher in forming the average and high level of the pupils' cartographic competence.

Key words: geography teacher; subject competence; cartography; cartographic competence.

Wpłynęło: 19.03.2021

Zaakceptowano: 2.08.2021

Zalecany sposób cytowania / Cite as: Nazarenko T., Topuzov O., Chasnikova O., Dubrovina I. 2021, Role of geography teacher in forming the pupils' cartographic competence, *Prace i Studia Geograficzne*, 66.2, Wydział Geografii i Studiów Regionalnych Uniwersytetu Warszawskiego, Warszawa, 43–53, DOI: 10.48128/pisg/2021-66.2-03.

¹ Corresponding author: Iryna Dubrovina, email: eduard_netcorps@yahoo.ca

INTRODUCTION

The modern Ukrainian school faces a serious task, which is to provide knowledge and communication skills for its pupils that will enable them to perceive and process large information flows presented in various sign systems quickly, and teach how to use modern means, methods and technologies for working with the information sources.

Modern society lives in a system of signs. Drawings, diagrams, topographical and geographical maps, numerical data, tables, formulas, signatures, inscriptions, texts, road signs, various types of conditional signals are all integral features of the manifestation of modern civilization. A geographical map is also a landmark system with specific information on it. Maps are compiled based on field studies, aerial and space imagery and other mapping sources, statistics and literature.

In 2006, the European Parliament and the European Union Council chose eight key competences for lifelong learning. The basic knowledge, skills and competencies associated with these competencies are defined as following: confident, critical and responsible use and interaction with digital technologies for training, work and community participation. „This includes information literacy and data literacy, communication and collaboration, the creation of digital content (including programming and mapping), security (including knowledge of digital well-being and cyber security) and addressing various issues, including economic, social and personal” (EU Key Competences and Basic Skills, 2018).

The military events that have recently taken place in the Eastern Ukraine convinced us that knowledge of the maps is extremely necessary especially in wartime. The role of a geography teacher lies precisely in forming cartographic competence among high school pupils.

The aim of the paper is to explain the role of the geography teacher as a consultant who forms a cartographic competence, including cartographic knowledge and map reading skills. The objective of the paper is to determine the role of a teacher as a transmitter of geographical knowledge and cartographic competence to the pupils through the activity approach.

A systematic review of literature and international legislative acts published from 1990th to 2020 was carried out and a narrative synthesis of the results has been presented to address these questions. The empirical data was collected with the use of proper methods. To make the synthesis systematic and comprehensive, the factors influencing the role of geography teacher in forming of pupils' cartographic competence have been discussed.

THEORETICAL FRAMEWORK

In terms of modern culture, signs play a big role, which do not have expressive similarity with a drawing object (words are not like the items in question, music notes are not like music, money is not like goods, mathematical formulas that describe and allow you to determine the course of an airplane, are not similar to an airplane, or the trajectory of its flight, *etc.*). Therefore, successful professional implementation requires special inclination for immersion in the imaginary world of dry notation, for distraction from the actual object properties of the surrounding world, and focus on the information that carry with them certain signs. Work with signs, as well as in work with any objects, requires certain control, verification, accounting, processing of information, and creation new signs, in order for a person to feel safe in the environment. Geography cannot be learned without using a variety of geographic maps and forming cartographic competence. A modern lesson of geography differs from other lessons precisely in the presence of a geographical map and pupils' work with it.

The writer Mykola Gogol in his article „Thoughts on Geography” presented the method of teaching geographers. The author insisted, „Only a map can be in front of a student's eyes. No unnecessary

words and lectures: the book can only interfere with the assimilation of the material. Only visual, vivid images" (after: Krylovets 2009).

Continuing the thoughts of M. Gogol about the significance of a geographical map, the outstanding geographer N. Baransky (2001) aptly wrote about this issue in his time. He emphasized the importance of the geographical map, stressed that: „Map is the alpha and omega (that is, the beginning and end) of geography”; „Map does not tolerate empty spaces, empty spaces on the map signal the failure of geographical research”; „Map contributes to the discovery of geographical patterns, that is, the laws of space distribution, correlation, combination and interaction of phenomena on the surface of the globe”; „Map is an intermediary between the researcher and the object of his research”; „Map is the ‘second language’ of geography, like a drawing in geometry”; „Map is not only a necessary research tool, but also an irreplaceable and irreplaceable element of a geographic image”; „Map is one of the criteria of geography”; „Map is a tool for detecting geographic correlations”; „Map is a means of visualization”, *etc.*

Increasingly, the educators and researchers recognize the importance of spatial thinking, geospatial technologies, mapping in developing geographical thinking and cartographic competence of pupils. Cartographic competence includes the understanding of map concepts and the practicing of map skills in working with or drawing maps (Havelková, Hanus 2019). However, a study of the scientific sources has shown that specification of cartographic competence and the role of teachers in teaching them among pupils can be problematic (Herrmann, Pickle 1996; Kimerling *et al.* 2009; Wiegand 2006).

All geographic studies are closely connected with an ability to develop the cartographic competence. Cartographic competence can be further specified based on operations corresponding to reading, analysis and interpretation of maps, and the environment where these skills are used (Carter 2005; Kimerling *et al.* 2009; Liebenberg 1998; van Dijk *et al.* 1994; Wiegand 2006). The characteristics of any territory, country, conducted measurements, predictions, analyzes, generalizations, drawn conclusions are based on competencies in map reading. That is why, in the actions of the teacher, there should be interactivity between pupils and geographic maps as sources of information. It is needed, however, to understand the role of a teacher and the way of construction of the educational process in geography effectively so that pupils develop such cartographic competence, as the ability to distinguish conditional marks, read the map, find and distinguish between various geographical processes and phenomena *etc.*

The content, structure and volume of cartographic material in the school course of geography in primary school in Ukraine is determined by legal documents, primarily the State Standard of Basic and Secondary Education (Decree of Cabinet of Ministers of Ukraine 2020). State requirements for the level of geographical education of pupils include the ability to use plans, maps, aerial photographs and other sources of geographical information. In our opinion, the effectiveness of the formation of cartographic competence is significantly influenced by the content of educational material, the sequence of study, its distribution by topic and separate courses in geography curricula. The cartographic level should be formed at the beginning of the geography course, but it requires additional time and a variety of methodological approaches.

One of the important components of geographical education at the present stage of development of the Ukrainian secondary schooling is the introduction of Information and Communication Technologies ICT in the educational process. Almost a decade has passed since pupils received the first, albeit primitive by today's standards, pedagogical software product. The next step in computer support was to study geography through various multimedia programs and various Internet resources. They have been actively introduced into ICT, used in the school geographic and cartographic lessons, and the new cartographic teaching instruments have been created for pupils (Topuzov 2008).

An important study of the competencies acquired by pupils in geography lessons was the study conducted within the Geospatial Management Competence Model (GMCM). This model defined 74

core competencies and 18 areas of competence characterizing the work of the most successful managers in the geospatial industry (Pirog 2016). In this model, Geographic Information Systems (GIS), cartography, spatial statistics, and field techniques were identified as fundamental to the geospatial industry. GIS skills enable pupils to acquire, manage, display and analyze spatial data digitally.

Analyzing printed publications and the scientific works of various specialists in cartography, we have concluded that this problem is relevant and topical for the modern society. We often use maps in such areas as land resources and their distribution, preparation of development plans, ensuring the country's defense and security, solving border problems, determining routes (roads, railways, oil or gas pipelines, tourist routes, ecological paths *etc.*). It is necessary to develop cartographic competence of schoolchildren on geography lessons to achieve this (Mohale *et al.* 2020). The set of competencies was also based on the studies of university students and graduates (Gedye *et al.* 2004) and a survey of 1347 respondents who studied national geographic programs in Krakow in 2011 (DiBiase *et al.* 2010).

Cartographic competence is fundamental to the production, creation, and design of papers or digital maps (Pessel 2019). It plays a crucial role in interviewing, preparing questionnaires, conducting observations, interpreting photographs *etc.* The use of quantitative methods is important in manufacturing calculations, models, and inferences about space, spatial patterns, and spatial relationships (DiBiase *et al.* 2010).

In the past, the problem of providing schools with cartographic products was solved. The cartographic market is replete with high-quality printing, artistically executed products that promote aesthetic education, but not always scientific and deep in content. The choice remains for the teacher, according to his competence. The success of the use of maps will depend on the level of professionalism of the geography teacher, on his ability to form pupils' desire to access the map, to be able to read and understand it. Therefore, the method of studying the basics of cartography in school courses of geography needs updating.

RESEARCH METHODOLOGY

In the process of theoretical study and empirical research, we used a combination of the following methods.

- **t h e o r e t i c a l**: analysis, synthesis, concretization, comparison, generalization, and systematization of theoretical material for deepening knowledge about the cartographic competence, in particular, the pupils' cartographic competence;
- **e m p i r i c a l**: questionnaire „Cartographic Competence” developed for this study (for diagnosing the level of cartographic competence). Sample of the research consisted of 112 respondents: pupils of the 10th grade, their parents and geography teachers (42, 40 and 30 respectively);
- **m e t h o d s o f m a t h e m a t i c a l a n d s t a t i s t i c a l p r o c e s s i n g o f e m p i r i c a l d a t a**: Pearson's correlation coefficient (to determine the correlation between the level of cartographic competence of pupils and the factors influencing it), and the one-factor dispersion analysis of variance ANOVA and the results of descriptive statistics for evaluating the level of development of pupils' readiness to acquiring the cartographic competence. All data of this experiment were processed using SPSS.

The design of our research involves the following steps:

1. Given the fact that there was no specific questionnaire aimed at identifying the level of cartographic competence of pupils, we designed a new questionnaire.
2. During the second stage, we selected respondents who were divided into groups (pupils of the 10th grade, their parents and geography teachers); the Google-forms were developed.

3. The third stage included analysis and mathematical and statistical processing of the obtained empirical data obtained.

The accuracy and validity of the research conducted was ensured by representativeness of the sample, the use of the methods relevant to the topic, aim and tasks of the study, the use of quantitative and qualitative analysis of the received empirical data by using the above stated methods of mathematical statistics. The empirical study we conducted was to diagnose correlation between the levels of cartographic competence of pupils and the main factors that have impact on it. Sample of the research consisted of 112 respondents: pupils of the 10th grade, their parents and geography teachers (42, 40 and 30 respectively). Participants took part online on a voluntary basis and were chosen randomly to participate in the study. The empirical research was conducted in two stages: the first – from May to June 2020, the second – from September to October 2021. The purpose of this test was to diagnose the (average) self-assessment of the cartographic competencies acquired by the pupils during the educational process. Respondents filled in to the questionnaire using the online Google forms on the website of the Institute of Pedagogy of the National Academy of Pedagogical Sciences of Ukraine.

The empirical research was executed in frames of the plan of implementation of the research work titled „Scientific and methodological support of competently oriented education of economics and geographical courses of economic orientation in universities and lyceums” for 2019 and the paragraph 1 of the Decree of the State Institution „Institute for the Modernization of the Content of Education” of May 11, 2019 No. 4 on the topic „Development of geographical education in secondary schools of Ukraine”. The composition of a working group was formed considering paragraph two of the Decree of the State Institution „Institute for the Modernization of the Content of Education” No. 08 of April 8, 2019.

The research was conducted in several stages, which included the collection and processing of primary information from various sources; development of regulatory framework; preparation of instructional and methodological recommendations for conducting the research; toolkit development (questionnaires for three groups of respondents); preparing Google survey forms calculating the representativeness, reliability and validity of the sample population *etc.*; appointing coordinators and familiarizing them with the questionnaire; adjusting the consistency of the sample population; advisory activities; analysis and generalization of research results; dissemination of the results to the wider educational community.

RESULTS

The results of the pupils' own assessment of the formed cartographic competencies are presented in Table 1.

As we can see, students of the 10th grade mostly (61.8%) think that their cartographic competence level is sufficient for allowing them to understand the cartographic information enough for being successful in this subject. Moreover, another 11.4% think that they have mastered this type of knowledge and can use the cartographic understanding fluently. However, about 27% of the respondents have expressed their feeling that they do not possess necessary competence and knowledge.

We also evaluated the level of cartographic competence in the estimation of the pupils, their parents and schoolteachers (Table 2, Figure 1). It is quite easy to notice that average level of evaluation of the pupils' cartographic competence prevails among all categories of the respondents (61.9% – pupils, 75.0% – parents, 53.3% – teachers). The levels of the indicators might be interpreted that pupils are not yet ready enough for future cartographic and geographical activities, however, their level of cartographic skills and knowledge allow working sufficiently during the geography lessons.

Table 1. Pupils' own assessment of the formed cartographic competencies, %**Tabela 1.** Ocena własnych kompetencji kartograficznych przez uczniów, %

Assess your awareness of mapping general geographic aspects (spatial orientation, map types, scale, map legend, geographical coordinates, aerial photos, etc.)	
I am fluent in cartographic concepts	11.4
My level of knowledge allows me to define cartographic concepts	61.8
I do not have the necessary knowledge	26.8

Source: Authors' own elaboration.

Źródło: Opracowanie własne.

Table 2. Estimated level of pupils' cartographic competence (Npu = 42, Npr = 40, Nt = 30), %**Tabela 2.** Szacowany poziom kompetencji kartograficznych uczniów (Npu = 42, Npr = 40, Nt = 30), %

	High	Average	Low
Pupils	33.3	61.9	4.8
Parents	15.0	75.0	10.0
Teachers	6.7	53.3	40.0

Source: Authors' own elaboration.

Źródło: Opracowanie własne.

It is worth noting that almost half of the pupils according to the teachers' estimation (40.0%) have low level of cartographic skills.

Among the pupils we observed a high level of willingness to learn geography and to acquire cartographic skills [$F = 10.164$, $p = 0.000$]. The indicators also showed that the parents' influence on the pupils readiness to execute independent cartographic activity is also high [$F = 12.186$, $p = 0.000$]. Studying the general level of development of cartographic competence, we determined that in the last years of studying (10th grade), such indicators are the highest [$F = 13.601$, $p = 0.006$]. The empirical research revealed an increase in the pupils' willingness to study geography and acquire cartographic competence by the end of their studying.

The geography teachers also confirmed this statement. More than 91.5% of geography teachers reported a steady and even growing cognitive interest of pupils in the study of maps and cartography in recent years. Of these, 43.6% of teachers said that there was a steady interest and 47.9% that it was growing. Only 8.5% of teachers indicated admitted declining interest of pupils in cartography. The strength of correlations between the levels of cartographic competence of pupils and the factor impacting its development among the pupils have been determined (Table 3).

It is obvious from our correlation analysis that a high level of cartographic competence of pupils has a strong connection their own will to study geography and cartography (0.894 , $p \leq 0.01$) and with the teachers' professionalism and impact during the educational process (0.880 , $p \leq 0.01$). The average level of cartographic competence correlates with parents' impact on pupils (0.856 , $p \leq 0.05$) and, to a greater extent, with teachers' impact (0.902 , $p \leq 0.05$). Correlation analysis has also demonstrated an inverse correlation between the parents' impact and the pupils' cartographic competence (-0.202 , $p \leq 0.01$).

Our empirical research has showed that pupils with an average level of cartographic competence (according to the authors' questionnaire) significantly dominated. Correlation analysis has allowed us to state that the majority of students in their learning activities at the lessons of geography and cartog-

raphy rely on their own conscious learning and motivation, as well as the teachers' professionalism in teaching and interaction during the process of learning. Least of all the pupils rely on the parents' advices and influence, as the greater pressure parents put regarding studying the less successful and efficient it is for the school pupils.

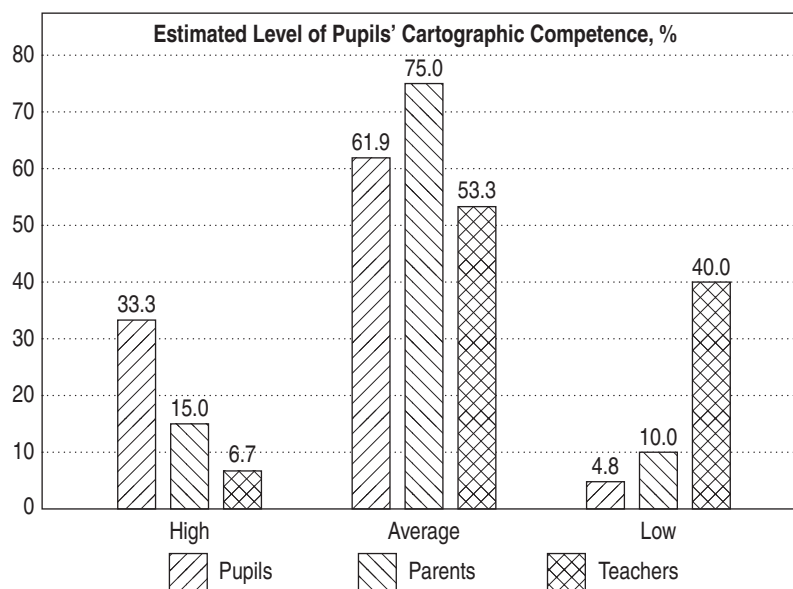


Fig. 1. Estimated Level of Pupils' Cartographic Competence by Pupils, Parents and Teachers, %

Source: Authors' own elaboration.

Ryc. 1. Szacowany poziom kompetencji kartograficznych uczniów według uczniów, rodziców i nauczycieli, %
Źródło: Opracowanie własne.

Table 3. Indicators of correlation between levels and impact factors for the cartographic competence development among pupils

Tabela 3. Wskaźnik korelacji między poziomami kompetencji kartograficznych uczniów a czynnikami wpływającymi na ich rozwój

Level of Cartographic Competence	Factors of Impact		
	Own will	Parents	Teachers / Educational Process
High	0.894*	—	0.880*
Average	—	0.856**	0.902**
Low	—	-0.202*	—

* $p \leq 0.01$, ** $p \leq 0.05$

Source: Authors' own elaboration.

Źródło: Opracowanie własne.

DISCUSSION

Theoretical analysis of teaching practices has shown that only when the teacher constantly use maps during the geography lessons, pupils are more successful in understanding cartographic concepts, however, the influence of different methods and techniques on students' cartographic skills should be further determined (Gökçe 2015). Only deliberate and systematic work on the formation of methods of map reading the map leads to the acquisition of cartographic competence and develops pupils cognitive activity.

Theoretical studies and empirical research in geographic and cartographic fields, allow us to conclude that the following factors seem to be crucial in the process of pupils' acquisition of cartographic competence: pupil's personal characteristics (critical thinking, use of proper strategies of problem solving, cartographic knowledge); map characteristics (comprehensibility / presence of legend, map composition, map cartographic / content accuracy, degree of abstraction of theme / phenomenon / means of expression, orientation of map in relation to cardinal directions, cartographic projection *etc.*); external factors (curriculum requirements, teachers' teaching style, GIS and ICT development), which supports the findings of Havelková and Hanus (2019).

Among the specific socio-pedagogical problems, the central place belongs to the contradiction between the growing amount of knowledge and the limited opportunities for self-regulated assimilation of the knowledge by individual pupils. Attempts to resolve this contradiction have led to a specially defined educational idea – the maximum development of human cognitive abilities to develop self-regulation and reflexive competence. It is necessary to ensure the right of a person to choose areas of education, which leads to the introduction of a sufficiently early differentiation of education and the creation of continuing education systems. The idea of continuing education is possible only by preparing the necessary conditions for self-education: creating an organizational and legal framework for access to various sources of information, formation and development of human abilities related to its search, processing, perception, understanding and use (Balashov *et al.* 2020).

There is a problem of formation and development of information culture of the individual through the formation of digital competence. This emphasizes the role of the teacher of geography as a guarantor, which forms the necessary skills and competencies of pupils through the cartographic content of geography and its taxonomy. Modern times set certain tasks to provide answers through the skills of adaptation of pupils to life in the information society. It may happen through the development of information and communication culture through various media in order to give pupils the opportunity to solve various problems confidently (Adams 2010; Gould 1991).

However, the practice of informatization of secondary education institutions has raised a number of problems. One of the most acute is the problem of „pupils' resistance to teachers and parents” to the introduction of new technologies into the learning process, caused by the contradiction between collective forms of learning, characteristic of a class-specific system, and the individualization of learning, which is stimulated by personal means (computer, laptop, smartphone *etc.*). This has been supported by our empirical research, which proved that pupils mostly rely on their own motivation and knowledge in studying geography (Table 3).

Our theoretical analysis has proven that teachers of geography and methodologists have gathered some critical material on the study of geography through new textbooks. Today wide discussion of all issues and aspects of further improvements in geography teaching has begun, including the balancing of quantitative and qualitative indicators of cartographic content. Thus, the efficiency of the cartographic component largely depends on the form the optimal combination of the requirements of the curriculum, on the one hand, and the requests and capabilities of pupils, on the other. Professional improvement of teachers is connected with the formation of motivation concerning professional activity and professional abilities and competences. This leads to self-movement towards the needs, motives, goals and objectives of the teachers (Havelkova, Hanus 2019).

Education in the field of information technology does not displace the traditional – the amount of „paper” and „digital” information continues to grow. A multilevel system of providing information on different media and in different sign systems is gradually developing, in which traditional and information technologies interact closely. Due to the emergence and development of many sign systems, which creates a multi-component „information field”, there is a problem of information (communicative) adaptation of the individual pupils and teachers in the society. Moreover, the task of the teacher is to draw the attention of pupils to the different sign systems, including cartographic ones.

It is difficult to disagree with the statement of R. Zemledukh: „Mapping cannot be taught with the use of only verbal methods. It is necessary to constantly apply visibility, exercises with cards and other manuals” (Zemledukh 1993). To enhance development of the pupils' cartographic competence, a geography teacher should include some innovativeness to the teaching process. The classes should include interactive approaches, which enlivens pupils' perception of the material, instills interest in learning the subject, and improves their creativity. For example, a teacher can use interactive crossword puzzles or interactive maps where pupils move one finger in continental space and use it during testing, such as in a test mode. In-service training programs should be conducted in order to help teachers catch up on skills in preparing and using maps and in technologies, such as GIS, Google Earth, and Google Map (Gökçe 2015). These technologies are powerful tools in this work as they provide high visibility of displaying diverse information in the form of interactive electronic maps.

ICT should be actively implemented in school geography. In particular, new cartographic means of teaching electronic media have been created. The update requires a methodology for studying the basics of cartography during school geography courses. Cartography is considered as a science of system information-cartographic modeling and knowledge of geosystems. If we look at the current structure of cartography, it should be noted that it is not something frozen and unchanged.

Consequently, it is necessary to change the method of teaching geography in the direction of digitization of cartography. The emergence of GIS has led to the creation of a new direction in mathematical cartography – satellite positioning. In recent years, Internet mapping has become a commonplace thing. On the market of computer technologies, new hardware-software for cartographic Internet systems appeared, and multimedia has become part of everyday life practice, when it is possible to determine the location of geographic objects using the help of a smartphone coordinates. All these changes should be widely reflected in the school curriculum, in particular in the methodology of teaching geography at school. Therefore, the teachers should be developing professionally to be able to use these modern technologies in teaching.

CONCLUSIONS

Our results of theoretical analysis and empirical data has shown that the problematic issues that have been experienced by school pupils in cartography remain at the modern school. In addition, if the issue of including relevant topics and sections of school cartography in educational programs today is solved more or less satisfactorily, scientific and methodological support for the study of cartography in school remains insufficient. The results of the correlations that we received highlighted the important role of a geography teacher in forming the average and high level of the pupils' cartographic competence.

Considering the changes in the content and structure of geographical cartographic education in Ukraine in recent years, we concluded that the most important direction in the development of school cartography in the future would be the widespread introduction of information and telecommunications technologies, especially GIS. The emergence of a new digital cartographic product, based on

which programmable pedagogical tools are created, will stimulate the further development of the school geography methodology, the contents of which include cartography.

Geography teachers who develop pupils' geographical competences should ensure that pupils receive sufficient geographic support for a specific subject related to geographical competences development. The lectures, textbooks, and hands-on exercises should be tailored to prior knowledge and practical facilitation, as it was stated in the works about relevant methods for improving pupils' abilities and skills in the field of maps (Jo, Bednarz 2014; McKay 2016).

Detected disadvantages in the geographical preparation of pupils can be largely eliminated if in the learning process a predominant activity approach that is based on the transfer of the advanced knowledge to the pupils and forms the ability to acquire knowledge independently when working with different types of information. To do this, it is necessary to develop the adaptation skills of pupils in the information society through the development of information and communication culture by various information tools (textbook, manual paper and digital, educational books, television, radio, newspapers, magazines, directories, Internet *etc.*).

The study does not examine all aspects of the problem of cartographic competence of the school pupils. The scientific rationale deserves the development of technology teaching activities in an information society, pupils' adaptation to various digital gadgets, from mindless use to useful application goals and security. In addition, the continuing education of geography teachers should demonstrate this, as recent monitoring studies have convinced us that when the teacher is fluent in the latest digital opportunities, pupils demonstrate high learning outcomes. Therefore, the future success of the students in the formation of cartographical competence largely depends on the personal and professional qualities of the teacher. Teachers should devote more attention to developing pupils' cartographic competence which is essential in today's world, such as critical evaluation of information depicted on a map, formulation of generalizations, conclusions, and predictions based on cartography.

The level of development of cartographic competence of pupils probably increases throughout the study. To verify and confirm this statement, it is necessary to conduct a longitudinal study and track the development of cartographic competence of pupils.

References

- Adams P., 2010, A taxonomy for communication geography, *Progress in Human Geography*, 35(1), 37–57, <https://doi.org/10.1177/0309132510368451>.
- Balashov E., Pasichnyk I., Kalamazh R., Zdrobylko T., 2020, Reflexive Competence in Metacognitive Monitoring of Learning Activity of HEI Students, *International Journal of Cognitive Research in Science, Engineering and Education. Special Issue Current Research and Trends in Cognitive Sciences*, 8(1), 17–28 <https://doi.org/10.23947/2334-8496-2020-8-SI-17-28>.
- Baransky N., 2001, *My life in economic geography*, Moscow State University, Moscow.
- Carter J.R., 2005, *The many dimensions of map use. Proceedings of the XXII International Cartographic Conference*, (A Coruña), 1–9.
- Cheung Y., Pang M., Lin H., Lee C.K.J., 2011, Enable Spatial Thinking Using GIS and Satellite Remote Sensing – A Teacher-Friendly Approach, *Procedia Social and Behavioral Sciences*, 21, 130–138, <https://doi.org/10.1016/j.sbspro.2011.07.014>.
- Decree of the Cabinet of Ministers of Ukraine „On some Issues of the State standards of complete secondary education” #898 of 30.09.2020, 2020, Access mode: http://ru.osvita.ua/legislation/Ser_osv/76886/ (accessed: 03.03.2021).
- DiBiase D., Corbin T., Fox T., Francica J., Green K., Jackson J., Jeffress G., Jones B., Jones B., Mennis J., Schuckman K., Smith C., Van Sickle J.V., 2010, The new geospatial technology competence model: Bringing workforce needs into focus, *Urisa Journal*, 22(2), 55–72.
- EU Key Competences and Basic Skills, 2018, https://ec.europa.eu/education/policies/school/key-competences-and-basic-skills_en (accessed: 09.03.2021).

- Gedye S., Fender E., Chalkley B., 2004, Students' undergraduate expectations and post-graduation experiences of the value of a degree, *Journal of Geography in Higher Education*, 28(3), 381–396.
- Gould P., 1991, People in the Information Space: Mental Maps and Information Surfaces of Sweden, *Lund Geography Studies. Series B. Human Geography*, 42, Royal University Press, Lund.
- Gökçe N., 2015, Social Studies in Improving Students' Map Skills: Teachers' Opinions, *Educational Sciences: Theory and Practice*, 15(5), 1345–1362, <https://doi.org/10.12738/estp.2015.5.0071>.
- Havelková L., Hanus M., 2019, Map skills in education: a systematic review of terminology, methodology, and influencing factors, *Review of International Geographical Education Online (RIGEO)*, 9(2), 361–401, <https://doi.org/10.33403/rigeo.591094>.
- Herrmann D., Pickle L.W., 1996, A cognitive subtask model of statistical map reading, *Visual Cognition*, 3(2), 165–190, <https://doi.org/10.1080/713756734>.
- Jo I., Bednarz S.W., 2014, Developing pre-service teachers' pedagogical content knowledge for teaching spatial thinking through geography, *Journal of Geography in Higher Education*, 38(2), 301–313, <https://doi.org/10.1080/03098265.2014.911828>.
- Kimerling A.J., Buckley A.R., Muehrcke P.C., Muehrcke J.O., 2009, *Map Use: Reading and Analysis*, ESRI Press Academic, Redlands.
- Krylovets M., 2009, Mykola Gogol as a Geographer, *Geography and basics of economics at school*, 3, 42–44.
- Liebenberg E.C., 1998, Teaching Map Use in a Multicultural Environment, *South African Geographical Journal*, 80(2), 111–117. <https://doi.org/10.1080/03736245.1998.9713654>.
- McKay T.M., 2016, Do tutors maters? Assessing the impact of tutors on first – year academic performance at a South African University, *Journal of Student Affairs in Africa*, 4(1), 53–64, <https://doi.org/10.14426/jsaa.v4i1.144>.
- Mohale D., McKay T., Van der Merve C., 2020, The Nature of Cultural and Heritage Tourism in Greater Polokwane, Limpopo, South Africa, *African Journal of Hospitality, Tourism and Leisure*, 9(6), 930–943, <https://doi.org/10.46222/ajhtl.19770720-60>.
- Pessel W.K., 2019, Uporczywe kartografie i mapy z Doliny Muminków, *Prace i Studia Geograficzne*, 64.4, Wydział Geografii i Studiów Regionalnych Uniwersytetu Warszawskiego, Warszawa, 53–65.
- Piróg D., 2016, The Role of Competences for Geography Higher Education in University-to-Work Transition, *Geographia Polonica*, 89(2), 221–236, <http://dx.doi.org/10.7163/GPol.0055>.
- Schlemper M.B., Athreya B., Czajkowski K., Stewart V.C., Shetty S., 2019, Teaching Spatial Thinking and Geospatial Technologies Through Citizen Mapping and Problem-Based Inquiry in Grades 7–12, *Journal of Geography*, 118(1), 21–34. <https://doi.org/10.1080/00221341.2018.1501083>.
- Topuzov O., 2008, *Library of electronic visual aids. Geography, grades 7–11. For secondary schools*, K.: SE Institute of Pedagogical Information Technologies.
- Topuzov O., Nazarenko T., Kapirulina S., 2008, *Training Tests for Preparing to External Independent Evaluation in Geography* [E-Textbook], Kyiv: DP IPTP.
- van Dijk H., van der Schee J., Trimp H., van der Zijpp T., 1994, Map skills and geographical knowledge, *International Research in Geographical and Environmental Education*, 3(1), 68–80, <https://doi.org/10.1080/10382046.1994.9964928>.
- Wiegand P., 2006, *Learning and Teaching with Maps*, Routledge, New York.
- Zemledukh R., 1993, *Kartohrafyya s osnovamy topohrafyy: uchebnoe posobye* [Cartography with the basics of the topography: a tutorial], Vyshcha shkola, Kyiv.