

PROBLEMS OF DEFINITION AND WAYS TO PREVENT PLAGIARISM  
IN STUDENT CARTOGRAPHIC WORKSПРОБЛЕМИ ВИЗНАЧЕННЯ ТА ШЛЯХИ ПОПЕРЕДЖЕННЯ ПЛАГІАТУ  
В СТУДЕНТСЬКИХ КАРТОГРАФІЧНИХ ТВОРАХ

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*The article is devoted to the study of the problem of definition and possibilities of plagiarism prevention in cartographic works, which are developed by students of mainly geographical specialties in the process of acquiring professional competencies. The article analyzes the essence and features of plagiarism in cartographic works, describes its varieties and basic principles of identification. Attention is paid to the legal basis for the establishment and protection of cartographic materials as a result of intellectual property. The key differences between development and editing from a cartographic point of view are described, the methods of which are used to develop primary and derivative maps, respectively. It has been established that most student cartographic works are derived maps developed on a certain cartographic basis with the addition of the results of their own research. There are also primary and secondary types of plagiarism in student cartographic works, which are manifested in their special forms and have different essences. Therefore, we analyzed the technical aspects and methods of creative editing of cartographic materials in order to eliminate the possibility of plagiarism. Peculiarities of acquisition of cartographic competencies by students of geographical specialties, which influences the level of plagiarism development in student works, are described. As a result, the basic, initial and progressive stages of acquiring cartographic competencies are distinguished, in each of which students perform educational tasks with a gradual increase in the level of complexity and learn the features of modern GIS for developing, editing and composing maps. As a result of the research, a number of recommendations were developed for the preparation and presentation of student cartographic works in the form of completed research papers.*

**Key words:** *academic integrity, map, plagiarism, student research, cartographic competence, modern geographic information systems.*

*Стаття присвячена вивченню проблеми визначення та можливостей попередження плагіату в картографічних творах, розроб-*

*кою яких займаються студенти головно географічних спеціальностей у процесі набуття професійних компетентностей. У статті проаналізовано сутність та особливості плагіату в картографічних творах, описані його різновиди та базові принципи ідентифікації. Звернуто увагу на законодавчі основи встановлення і захисту картографічних матеріалів як результату інтелектуальної власності. Охарактеризовані ключові відмінності укладання та редагування з картографічної точки зору, методи яких використовуються для розробки відповідно первинних та похідних карт. Встановлено, що більшість студентських картографічних творів є похідними картами, що розроблені на певній картографічній основі із доповненням результатами власних наукових пошуків. Також виокремлено первинний та вторинний типи плагіату у студентських картографічних творах, які у проявляються у своєрідних формах та мають різну сутність. Тому нами було проаналізовано технічні аспекти та методи творчого редагування картографічних матеріалів з метою усунення можливості виникнення плагіату. Описано особливості набуття картографічних компетентностей студентами географічних спеціальностей, що впливає на рівень розвитку плагіату у студентських працях. У результаті виокремлено базовий, початковий та прогресивний етапи набуття картографічних компетентностей, на кожному з яких студенти виконують навчальні завдання із поступовим збільшенням рівня складності та засвоюють особливості застосування сучасних ГІС для розробки, редагування і компонування карт. У результаті проведеного дослідження розроблено низку рекомендацій щодо підготовки та представлення студентських картографічних творів у вигляді завершених науково-дослідних робіт.*

**Ключові слова:** *академічна доброчесність, карта, плагіат, студентські дослідження, картографічна компетентність, сучасні геоінформаційні системи.*

**Formulation of the problem in general.** An important factor in the development of modern geographical education and science in Ukraine is the observance by participants of the educational process of the basic principles of academic integrity (fairness, honesty, trust, responsibility, etc.) and prevention of plagiarism in academic environment [24, 25]. This is a modern requirement and helps to train highly qualified specialists in the field of geography, who are able to independently search for information about causation in the environment, individually solve the most complex applications of the natural field and successfully implement ideas in teaching.

Maps and individual cartographic works (atlases, series of maps, etc.) are an integral part of geography.

They are widely used in secondary and higher education institutions in the learning process to form spatial representations of the spread of various processes and phenomena in the environment, geographical objects, etc. Cartographic material is also used by geographers to present their own research results in publications, monographs and other scientific papers. Therefore, the cards are the result of intellectual work and, according to the Law of Ukraine "On Copyright and Related Rights" (Article 8, paragraph 12), are protected by copyright [5].

Special attention should be paid to student cartographic works, the compilation and formatting of which is one of the main program tasks of a number of disciplines of educational programs in geographical

areas. The implementation of information and cartographic competencies also takes place in the process of performing various research works, a kind of field and in-house research for writing dissertations, etc. Therefore, to evaluate various student works (practical, laboratory, course, qualification) and to establish the level of general professional training of students of geographical specialties, it is necessary to clearly define the ability of students to compile, develop and compose cartographic materials. It is accompanied by an analysis of student maps for plagiarism in order to determine the author's contribution to the development of a cartographic work. The problem of plagiarism in cartographic works is also important in the process of forming the values of academic integrity in higher educational institutions of Ukraine.

#### **Analysis of recent research and publications.**

Various aspects of the essence of academic integrity and its importance for the formation of professional competencies of students, the development of modern higher and school education have been considered by many domestic and foreign scholars in various fields. Today in Ukraine the problem of plagiarism and its definition is mainly related to socio-pedagogical and scientific-methodological problems of the educational space. Thus, the improvement of organizational principles of educational activities and the development of information technology affect the methods of determining various forms of plagiarism, including in cartographic works.

Analysis of recent scientific publications shows the lack of a holistic and systematic study of the features of the definition of plagiarism in cartographic works, which emphasizes the relevance of our study. However, the works of R. Sossa and O. Liubarets [21], T. Zanina and A. Kopytko [6], T. Makarysheva and A. Mryhlod [14] and others are important for the disclosure of the problem of plagiarism in student cartographic works. They are devoted to the analysis of the legal basis for the protection of cartographic works as a product of intellectual property. Fundamental values of academic integrity and the foundations of intellectual property, including products of cartographic nature, considered in the works of I. Verba and V. Koval [2], O. Nestertsova-Sobakar [8], T. Fishman [24], N. Iurko, I. Styfanyshyn and U. Protsenko [25] and others. A separate category of scientific research is devoted to tools and means of plagiarism search using modern information technologies and opportunities to edit cartographic works online, in particular – V. Nizhehorodtsev [15], V. Kulyk [9], S. Tkachenko [22] and others. The importance of adherence to the principles of academic integrity and the formation of cartographic competencies for the professional activities of future teachers of geography are revealed in the works of L. Datsenko [4], V. Nosachenko [16, 17],

V. Nosachenko and A. Rozsokha [18], O. Levada, V. Ivanova and O. Nepsha [12], T. Kushniruk and V. Dodurych [10], O. Braslavskaya and N. Barvinok [1].

**Highlighting previously unresolved parts of the overall problem.** Mapping and development of cartographic materials is an important skill for a specialist in the field of geography and professional teaching. The development of modern information technologies and the variety of tools for creating and editing raster images and vector data make it difficult to identify plagiarism from original cartographic products.

Professional public and private institutions specializing in the development of cartographic materials mostly work with large-scale projects and produce high quality cartographic products. They are mainly protected by copyright law, which reduces the risk of plagiarism. Instead, individual performance of small mapping tasks by students and limited resources increase the risk of plagiarism in the process of compiling cartographic material in its various forms. The lack of automated tools for determining plagiarism in student and any other cartographic works does not allow for prompt response and elimination of elements of plagiarism by teachers. Despite the review of the legal basis for the protection of cartographic works as a kind of product of intellectual activity in the scientific literature, today there is no holistic understanding of the essence of the problem and types of plagiarism in student cartographic works. Consideration of this topic will help solve the general problem of plagiarism in a specific cartographic direction of geographical science and justify measures for the appropriate organization of the educational process, mainly in higher education institutions of Ukraine.

**The purpose of the article** is to reveal the features and characteristics of forms of plagiarism in cartographic works, mainly thematic, which often allow students of geographical specialties in the process of performing cartographic tasks to term papers, dissertations and other research papers. Another important task of our study is to consider the organizational principles of detection and prevention of plagiarism in student cartographic works, as well as analysis of the legal framework for regulating the protection of cartographic materials as a special product of intellectual activity.

**Presenting main material.** Maps have special importance for the study and research work of students of geographical specialties. Throughout the educational process in higher education institutions, students work directly with a variety of cartographic material – topographic, thematic, electronic, paper, interactive and many other types of maps. In addition to the analysis of available maps, in the process of studying a set of disciplines in universities, students of geographical specialties study modern methods and approaches to creating cartographic material

using GIS technologies [11, 19]. The functionality of the modern GIS software environment and the results of remote sensing of the Earth available to students allow not only to develop new, unique high-resolution cartographic products, but also to modify existing maps [7, 11, 13]. Such opportunities contribute to the development of cartography and the improvement of cartographic products, but in the student environment there is a problem of determining plagiarism. Thus, the problem of plagiarism and its definition in student cartographic works is closely related to the features and level of students' acquisition of cartographic competencies, as well as their understanding and adherence to the principles of academic integrity in relation to the implementation of algorithms for processing and compiling cartographic materials.

Acquisition of cartographic competencies by students takes place mainly through the prism of mastering information and communication and geoinformation technologies [13]. For example, analyzing the structural and logical scheme of the educational-professional program "Geography" of the bachelor's level of higher education in specialties 106 Geography and 014.07 Secondary education (Geography) at Uzhhorod National University, we can distinguish three main stages of acquiring cartographic competence in higher education (Fig. 1). At the *first (basic) stage*, students learn the topographic basics and principles of working with topographic maps, which contributes to the formation of knowledge about the scale, cartographic projections, map elements and more. In the process of studying basic geographical disciplines (general geology, general and historical geology, soil science with the basics of soil geography, etc.) students work with a large number of mainly industry thematic maps, which helps to learn different styles of presenting spatial information on maps.

An important stage in mastering the methods and principles of mapping is the *second (initial) stage* of acquiring cartographic competencies, during which students learn the basics of geoinformatics and cartography. The name of this stage is connected with the acquisition of students' initial idea of the possibility of using GIS for geospatial analysis and modeling of various objects, processes and phenomena, as well as preliminary acquaintance with the principles of development of cartographic material as a result of a number of laboratory and practical classes in the disciplines of vocational training.

In-depth study and mastering of specialized software tools in order to master the latest methods of mapping takes place in the *third (progressive) stage* of acquiring cartographic competencies. The main task at this stage is to master the methods of processing geospatial data, methods of analysis and interpolation, as well as the acquisition of knowledge and mastery of practical methods of composing maps of various topics, scale, format, etc. At this stage students gain sufficient knowledge for further specialized or individual study of geographic information technologies, as well as able to independently compose author's cartographic works without the use of elements of plagiarism.

Thus, students during their studies at higher education institutions gradually acquire skills and abilities to work with geospatial data and develop, edit and format cartographic materials. Acquisition of cartographic competencies by students is necessary for their professional growth and formation of theoretical and methodological basis for compliance with the principles of academic integrity in the process of further implementation of research and dissertation tasks.

By definition, a map is a cartographic projection, a reduced, generalized image of the Earth's surface,

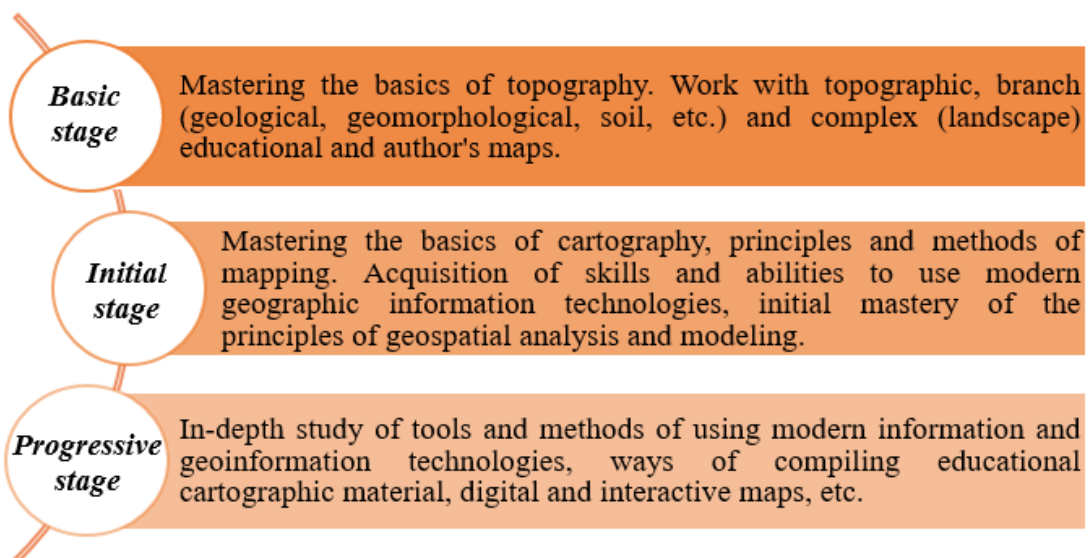


Fig. 1. Stages of acquisition of cartographic competencies under the educational program "Geography" of the bachelor's level of higher education

the surface of another celestial body or extraterrestrial space, showing the objects (objects and phenomena) located on them in a certain system of symbols [6]. In practice, the concepts of primary and derivative maps are also distinguished, the difference between which lies in the initial data of the stacking. Thus, the primary map is the result of geospatial analysis of non-cartographic materials, and the original numerical data, own field research, etc., on the basis of which a unique, qualitatively new map was actually developed. Instead, the development of a derivative map is based on already available cartographic materials [6].

Thus, the conclusion of the card should be understood as the development of its original copy, which is actually the result of intellectual, creative activity, which is protected by law on property rights. Such development of cartographic materials by students most often occurs in the process of research of socio-economic, and less often pedagogical and natural topics. For example, the study of socio-economic processes and phenomena (demographic situation, analysis of resource potential, etc.) is accompanied by the processing of mainly statistical (numerical) data. Their processing, geospatial analysis and interpolation are easily performed using the basic tools of geographic information software, which allows you to develop qualitatively new, author's maps. Such developments do not require plagiarism testing, and their identification is possible even by analyzing the source data of a student work.

To develop thematic cartographic material, students often use certain geographical bases, mainly topographical or general geographical content with basic landmarks (peaks, settlements, etc.), on which they apply the results of their own research. Such a topographic basis is also protected by copyright, and therefore in the case of its use by students without the consent of the copyright holder is considered plagiarism [2, 6].

Analyzing the features of research work of students of geographical specialties and the main tasks on the way to acquiring cartographic competencies, the creation of student cartographic works is by editing, which, in terms of cartography and copyright protection, has a special essence. In general, editing is understood as the process of qualitative content of a cartographic work by improving the stylistic design, nature of layout, methods and ways of presenting geospatial information, mathematical basis of the map and a number of other processes [6, 10, 14, 20, etc.]. Such editing of maps has peculiar features of the creative process, and therefore can also be considered as an author's contribution. Therefore, in order to avoid plagiarism, students in their cartographic developments must clearly indicate the source of the topographic basis on which the map was developed and indicate aspects of refinement.

Changing the scale and quality formatting of maps is directly accompanied by adjusting the image style, color scheme, line sizes and fonts of captions, their quantitative load and the nature of placement in accordance with the requirements and rules of cartographic generalization, map format and others.

Thus, most student cartographic works are essentially derived maps. They are created by editing existing maps, which with the help of modern geographic information technologies are superimposed on the results of their own research in the form of new cartographic layers.

In our opinion, in cartographic works plagiarism can manifest itself in various forms, which should be combined into two major groups: the first is the *primary plagiarism*, which is characterized by intentional copying of the main parameters of the mapping object (contours and boundaries, information about location of a geographical object, distribution of a process or phenomenon, etc.) and borrowing information about its structure, properties, etc., which is presented on the map without reference to the original source; an another group is *secondary plagiarism*, which is the appropriation of other people's ideas and approaches to composition, general style of cartographic material, as well as duplication of original symbols and features of their placement on the map, copying identical colors and more, which together determine the originality of a particular cartographic work as the result of intellectual work. It is important to note that secondary plagiarism in students' cartographic works does not include borrowing typical linear, planar or any other signs and symbols provided by the Industry Standards of Ukraine, a number of regulations of cartographic, urban, geological and other industries [3, 23].

An integral part of geographical maps is the legend of the map. It is formed by a set of symbols used in the development of the map to denote various geographical objects or processes, with a certain textual explanation. Depending on the subject of the map, its legend may differ significantly in the format and scope of the textual explanation. For example, the names of soil types on soil maps are indicated by one word or phrase, while the names of geocomplexes of different hierarchical levels or their types on landscape maps are relatively large and represented by whole sentences (a number of features are indicated like genetic affiliation, vegetation, etc.). Thus, in student cartographic works, plagiarism is sometimes found in the names and properties of mapping objects, if this information is the result of research by other researchers.

The biggest problem in determining plagiarism in cartographic works is the lack of opportunities for their automated verification. Due to the significant complexity of cartographic materials and the specifics of their laying, the possibility of this automation

remains in doubt. Therefore, to prevent plagiarism in cartographic works of students of higher educational institutions of Ukraine, it is first necessary to consider this problem in classes in geographical disciplines, which consider the theoretical and methodological foundations of development and formation of cartographic products, in particular: "Fundamentals of Geoinformatics", "Cartography", "Geographic information systems", "Information technology in geographical education and science" and others.

When organizing a plagiarism test of student works in geographical specialties at university departments, it is advisable to pay special attention to the theses of bachelors and masters, the preparation and defense of which usually requires the development of author's cartographic material with elements of novelty. To check it, it is necessary to form specialized departmental or faculty expert commissions, which should include specialists in the specialty of the submitted student work. The textual part of the legends of geographical maps, provided that it is placed in the appendix or in the text of the qualification work, must be analyzed for the percentage of words. In general, the detailed procedure for checking the cartographic works of students in each specialty should be regulated by the internal university Regulations "On Academic Integrity", which today need to be finalized in most higher education institutions in Ukraine.

An important task in compiling cartographic material is to comply with a certain scale of mapping objects and the degree of generalization on the map. Their violation may indicate a deliberate adjustment of the map in order to hide plagiarism or a combination of different maps on a scale without their own analysis of territorial distribution and other properties of the subject of mapping.

**Conclusions and prospects for further research.** The problem of academic plagiarism is important today and is related not only to the problem of adherence to the principles of academic integrity, but also to the computerization of the process of creating and editing cartographic materials. Modern cartography and its development are associated with the development of digital maps and the use of geographic information technology, which requires a clear structuring of the process of creating author's maps and identifying possible key aspects of plagiarism in the process of editing derived cartographic material. Students' cartographic works, which play an important role in their educational process and professional growth in general, are at risk of plagiarism. However, there are currently no tools for computerized plagiarism testing.

To prevent the occurrence of plagiarism in student cartographic, as well as any other works, it is important to explain to students the general principles of academic integrity, to create comfortable social and educational conditions in student groups, etc. Given

the specifics of students' research, to eliminate and prevent plagiarism in student cartographic works, as well as the possibility of their quality testing in student research papers, we recommend: detailed description and demonstration of the original data; detailed description of the method of processing and processing of initial data; demonstration of project materials from different stages of cartographic work; isolation and demonstration of the results of own research, search, analytical analysis; strict compliance with the latest requirements for the design of maps with the mandatory presence of elements of the author's style of layout of cartographic material, etc.

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