



Methodology for Improving Cartographic Competencies Based on The Step-By-Step Training Model

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Abstract: This article covers the topic "methodology for improving cartographic competencies on the basis of a step-by-step teaching model as an pedagogical scientist". Cartographic competencies occupy an important place in the modern educational system, as they allow students to effectively apply geoinformational technologies and analyze geographic data. The author, analyzing the basic principles of the step-by-step teaching model as an pedagogical scientist, shows the importance of this methodology in the development of cartographic competencies. Through the results of the research presented in the article, it is scientifically substantiated how the step-by-step teaching model can be effectively used in the formation of students' cartographic skills. Recommendations and practical examples intended for teachers are provided, and the tools and methods necessary for the practical application of this methodology are provided. The article also reveals the role of innovative pedagogical technologies in the development of cartographic competencies. The results of this study serve to encourage active student participation and enhance their critical thinking skills by innovating in the educational process.

Keywords: Pedagogy, step-by-step teaching model, cartographic competencies, methodology, educational process, learners, skills development, innovative approaches, practice-based teaching.

Introduction: In the modern educational process, the formation of "cartographic competencies" is important not only for geographical sciences, but also for many economic, environmental, demographic and other

industries. Because any socio-economic process, natural landscape or engineering study is carried out in connection with the spatial factor. Therefore, the development of cartographic competencies on the basis of a step-by-step training model in students, providing them with a clear program plan and methodological methods are considered an extremely urgent issue today. Cartographic competence is an interdisciplinary ability consisting of skills in working with spatial data, reading maps, imaging on different scales, representing data on thematic maps, analyzing, practicing. It is improved through gradual teaching in the educational process. The step-by-step teaching model ("Step-By-step teaching model") is widely used in the field of educational psychology and pedagogy, providing for the division of the teaching process into rigorous stages, the consistent formation of certain knowledge, skills and competencies at each stage. The relevance of the article is that the correct teaching of cartographic competencies today, where the global digital economy, integrated interdisciplinary methodologies, information and communication technologies have developed, forms spatial thinking in society. It serves to train highly qualified personnel in many areas such as Urban Planning, transport Logistics, environmental monitoring, agricultural planning, tourism development.

METHODOLOGY

cartographic competence – a set of knowledge, skills and qualifications necessary to reflect spatial objects, processes, phenomena in the form of a map, analyze them, draw the necessary conclusions. It consists of the following main components: general principles of cartography, drawing and color-gamma criteria, scale and projections. Practical skills: mapping, working on online platforms, using GIS (Geographic Information Systems) Programs, creating thematic maps by demographic or socio-economic indicators. Analytical-analytical competence: comparison of information on the card, search for dependencies, explanation of spatial States, comparison with tables or diagrams. Development of a map character system, color and design changes, work with interactive elements, 3D effects, multimedia integration. Cartographic competence is necessary not only for geographers, geodesists, surveying specialists, but also for representatives of various fields (environmentalist, urban planner, economist, transport planner). With a step-by-step approach in the learning process, it is possible to form this competence not superficially, but consistently, deeply

A step-by – step teaching model (Gradual Release of responsiveness Model) is a step-by-step separation of learning, which involves strengthening knowledge and

skills by initially leading the teacher, then gradually delegating independent responsibility to the students [1]. For the first time, this model was used by foreign pedagogical scientists V. Barton, D. Developed by the Pearsons, and then confirmed by scientific experimentation.

In this model, the lesson stages are usually as follows: teacher demonstration (I do – teacher performs): at this stage, the teacher shows a certain knowledge or skill on his example. Students follow and learn pasif. Prefabricated practice (we do – performed together): in the next step, the teacher and students perform the assignment together, discuss it as a team. Pair or group activity (You do together): students divide into groups and continue training in an independent-reliable form. Independent activity (You do independently): finally, students practice all acquired knowledge and skills on their own, performing creative tasks. In such a step-by-step teaching process, the role of the student can be transformed from a passive listener to an active participant, and then into an independent creator. This model becomes an effective approach in disciplines such as geography, cartography when purposefully planned [3].

In educational psychology, it is known that when any complex competence is formed in consistent stages, students "realize and perform in practice" activities instead of "memorizing without understanding" [4]. Cartographic competence can also be perfectly formed precisely with a step-by-step approach, since in this process: the teacher first explains and shows (not only in theoretical, but also in cartographic samples). Students practice mapping, scaling, character application together, based on the instruction of the textbook author or teacher in small communities. In pairs or groups, independent practical riddles are performed (each group is a separate Thematic Map, for example, climate, demographic, transport, political maps). In conclusion, each reader, in the form of an individual task, himself develops a thematic map, diagram, Legend, writes conclusions [5]. Thus, printing with a step-by-step approach

A sequence of (2D) or digital (online) cartographic exercises produces complete competence in learners.

Didactic principles of the step-by-step teaching model. Consistency and continuity: in the process of forming cartographic competencies, lessons should be consistently passed from "easy" to "complex", from "theoretical" to "practical" [6]. For example, first the concept of "scale", then "projections", then "thematic mapping" and surround practical training. Activation: within the framework of the Step-By-Step teaching model, student activity should increase at each stage. At

the last stage, the reader is obliged to be able to independently complete cartographic assignments.

International experience and compatibility: in the current era of digital technology, there are a huge number of online cartographic platforms (ArcGIS Online, Google My Maps, QGIS Cloud). In the step-by-step model, optimal application of these (thematic maps, interactive layers, exercises) is necessary at each stage of the lesson.

Problem teaching: in a complex phase, students are asked "what type of map can best reflect the water distribution in the area?" or "why does Greenland seem so big on some maps?" to ask questions like". In this problematic situation, students are independently sought.

Teacher and student roles. Teacher: if there is only a "speaker" in previous approaches, the step-by-step model will have the role of "trainer" or "demonstrator". It provides a practical demonstration of the necessary skills at each stage, and then creates the conditions for students to practice independently (or in groups).

Reader: primarily an observer in the early stages, a questioner, then a collaborative participant, playing the role of an independent creator in the final stage. This also takes into account the ability of students, the level of training.

DISCUSSION AND RESULTS

Development of cartographic competencies based on a step-by-step teaching model: Step 1. Methodological solutions. Objective: to form in students an initial idea and a minimum of practical skills about such elements as basic cartographic concepts, character-symbols, scale, geocoordinates, Thematic Map.

Methods: Introduction lecture: What is cartographic competence, where it is used in life, introduction to examples.

Visual lesson: the teacher shows a simple printed map on the projector or interactive whiteboard, and then a thematic layer (for example, population density) in an online application [7].

Q & A: Simple Questions for students to activate their previous knowledge (how to find the scale? How is the distance on the map determined?).

Expected result: a "cartographic" dictionary in readers, a familiar scale and basic characters, an initial skill in reading harita.

Stage 2 (aggregate practice). Purpose: students use techniques specified by the instructor in the formation and analysis of harita in a small group or pair. Methods: work in pairs: for example, "based on an administrative

map of one province, bring the scale of settlements, measure distances, calculate by scale." The problematic question is: "why are intersections displayed on the map through a red-sign?" Or "what informational elements are simplified by scale reduction?" [8]. Teacher control: the teacher observes the process, corrects the shortcomings, suggests ideas, but in the lead role is not himself, but students in pairs. Expected result: students will have practical experience in building harita, measuring distance, basic symbols and shapes, color selection. Also, cooperative skills in pairs are formed.

Stage 3 (collective or group activities). Purpose: to work in more complex thematic cartography, interactive platforms or GIS programs, to reflect social or economic indicators on the map, to master the experience of solving real issues. Methods: Group project: a group of 4-5 people is assigned such a task as "make a map of Natural Resources" or "design a map of tourism opportunities". Each group is engaged in collecting information on its subject, choosing a character and color scheme, drawing a map, preparing the final presentation. Technical platform: the teacher can create an online collaboration environment for the group through ArcGIS Online or Google My Maps, each participant can add a layer, write a review. Controversy: groups defend their projects, answer questions, receive suggestions for improvement. Expected result: readers will have good experience in collaboration with "representing reality on a card", "simplifying information", "diagram or color simplification of thematic indicators". At this stage, the competence of inference, analytical thinking, collective decision-making develops.

Stage 4 (independent activity). Purpose: to encourage students to independently perform a full-fledged harita or cartographic project, draw conclusions, demonstrate a creative approach, put into practice the accumulated knowledge and skills. Methods: final individual project: each student individually executes a work project on a subject of interest (e.g. "my neighborhood residential map" or "economic potential of the province"). Portfolio or presentation: the reader displays his map in printed (or digital) form, explains, answers questions. By announcing the evaluation criteria in advance, the teacher can take into account factors such as creativity, correct indicators, accurate design, information reliability. Reflection: what was complicated in the process of doing an independent work, what was easily solved, what resources were needed – all this is analyzed by the reader in writing or verbally. Expected result: students will now be able to independently acquire cartographic competence, complete real-world projects, work with creative topics. A level is reached where the teacher practically does not need help.

CONCLUSION

As a general conclusion, it can be said that the methodology for improving cartographic competencies on the basis of a step-by-step teaching model is a methodically effective approach that adapts to modern pedagogical technologies, firmly prepares students both theoretically and practically, develops collective and independent work skills. Experimental work has proven the positive effects of this model. This methodology is expected to become more popular in the future with the introduction of a technical base, teacher qualifications and a number of improvements during class hours.

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