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THEORETICAL AND METHODOLOGICAL FOUNDATIONS FOR DEVELOPING DIGITAL AND STATISTICAL COMPETENCE IN MASTERS OF GEOGRAPHY

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Abstract

The article analyses the problem of developing digital-statistical competence in master's students majoring in geography. Research by Uzbek scholars on geography teaching methodology, cartography, geoinformatics and population geography is summarised, and the existing scientific gap is identified. Based on the systems approach, the methodological aspects of studying digital-statistical competence as an integral pedagogical system are substantiated.

Keywords: geography education, master's degree, digital-statistical competence, statistical analysis, geographic information systems, systems approach, integrative competence, professional training.

Introduction

In today's context of globalisation and digital transformation, the higher education system faces the task of training competitive specialists who possess modern knowledge and skills and are capable of independent thinking. The Development Strategy of New Uzbekistan for 2022–2026, approved by Decree No. PF-60 of the President of the Republic of Uzbekistan dated January 28, 2022, sets as priorities raising the higher education enrollment rate to 50 percent, improving the quality of education, purposefully preparing 10 promising higher education institutions for inclusion in the QS and THE international rankings by



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2026, and expanding opportunities to study at bachelor's, master's and doctoral levels at prestigious foreign universities [10].

The aim of this article is to analyse domestic research on the problem of developing digital-statistical competence in master's students majoring in geography, to identify the existing scientific gap, and to substantiate the theoretical and methodological foundations of this process from the standpoint of the systems approach.

Literature review

In his works, A.N. Fayziyev studied the importance of using interactive methods in developing graphic training and created practical manuals aimed at strengthening the skills of drafting and reading technical documents. The scholar paid particular attention to the effective organisation of teaching technical drawing using CAD (Computer-Aided Design) systems [3]. D.B. Karimov, in turn, analysed the role of modern computer software in the teaching process and its effectiveness in enhancing graphic training. He developed a methodology for using geographic information systems (GIS) and other graphic software, demonstrating the advantages of modern technological approaches over traditional methods [6].

O. A. Mo'minov made a significant contribution to establishing the scientific and methodological foundations of geography teaching methodology. His research substantiates the pedagogical regularities of acquiring geographical knowledge, the content and structure of the geography lesson, and the formation of geographical concepts and practical skills. The approaches he proposed serve to consistently integrate the observation, comparison, generalisation, and analysis of geographical data into the learning process [8]. R. Qurboniyozov focused on learners' independent thinking, the comparative study of geographical objects



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and phenomena, and the consolidation of knowledge through problem-based and practical tasks [11].

The textbook co-authored by H. Vaxobov, N.R. Alimqulov and N.B. Sultanova covers the aims, tasks, content, principles and pedagogical technologies of geography teaching methodology. The authors placed special emphasis on integrating theoretical knowledge with practical activity, identifying cause-and-effect relationships of geographical phenomena, and developing students' analytical activity [14]. N.R. Alimqulov's works on topography and cartography reveal the possibilities of cartographic representation of geographical data, determining the spatial characteristics of territorial objects, and using maps as a source of information [1].

In the field of digitalising geography education, H. Nikadambayeva's research holds an important place. It develops a methodology for using electronic teaching and methodological support in teaching the physical geography of Uzbekistan and substantiates ways to increase the visual clarity and interactivity of educational information [9]. A.B. Janzakov improved the mechanisms of teaching geography in general secondary schools by means of information technologies and showed ways to increase the effectiveness of acquiring geographical knowledge through digital tools [5]. F.A. Xamroyeva improved the methodology of teaching physical geography disciplines in higher education based on media technologies [15].

In cartography, the scientific legacy of T. Mirzaliyev constitutes the theoretical and practical basis for the spatial representation of geographical data and the cartographic modelling of territorial information [7]. In the context of digital geography, the integration of cartographic data with statistical indicators requires the specialist to apply spatial and quantitative analysis methods jointly. The works of A.S. Soliyev and co-authors on economic and social geography address



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territorial production systems, economic zoning and regional development based on the analysis of demographic and economic indicators [12]. In Z.N. Tojiyeva's research on population geography, identifying territorial differences in population size, composition, movement and level of urbanisation requires the use of large volumes of statistical data [13]. The methodology of using statistical data in teaching economic and social geography was specifically studied by S.K. Djumabayeva [2]. Among foreign studies, the work of I.S. Sinitsyn devoted to preparing future geography teachers to use statistical methods deserves attention [20].

Issues of forming professional competence on an integrative basis are also considered in the research of J.A. Hamidov and D.O. Ximmataliyev. J.A. Hamidov developed modern didactic tools for teaching general professional disciplines in higher education by means of information technologies [4], while D.O. Ximmataliyev proposed a methodology for forming students' professional competencies through the integration of technical and pedagogical disciplines [16].

Research methodology

The study employed methods of theoretical analysis of scientific and pedagogical literature, comparative analysis, generalisation, system-structural analysis and modelling. The theoretical and methodological basis of developing digital-statistical competence in geography master's students is formed by approaches that ensure the integrity, consistency, structural clarity and scientific validity of this pedagogical phenomenon. These approaches ensure continuity between the philosophical and specific scientific methodology of the research and make it possible to define the content, boundaries, principles and procedures for studying



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the competence at the philosophical, general scientific and concrete scientific levels [19; 21].

The systems approach was adopted as the main foundation of the research at the philosophical and methodological level. The theoretical essence of the systems approach and systems methods is described in detail in the works of I.V. Blauberg and E.G. Yudin [18]. According to E.G. Yudin, any system should be studied, first, as an integral set of its constituent elements; second, in terms of the connections and relationships between the elements; and third, as a qualitatively new whole arising from their integration. An influence exerted on one part of the system causes changes in other elements and in the functional links between them, which ensures the integrity and dynamic development of the system [18].

Results and discussion

The literature analysis revealed that a certain scientific base has been formed in Uzbekistan for developing the methodological, practical, cartographic, geoinformational, and information-technological foundations of geography education. At the same time, in existing works the issue of forming geography master's students' skills in working with digital data and performing statistical analysis within a single integrative competence has not been sufficiently consolidated as a specific subject of pedagogical research. In particular, there remains a need for a methodological system that integrates obtaining geographical data from electronic sources, organising them in digital databases, processing them with statistical methods, identifying spatial and quantitative patterns, visualising the results in graphic and cartographic form, and interpreting them scientifically.

From the standpoint of the systems approach, developing digital-statistical competence is viewed not as a mere sum of separate knowledge, skills or



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technological operations, but as an integral pedagogical system consisting of interrelated components: goal, content, methods, tools, activity, diagnostics and outcome. A change in a master's student's system of statistical knowledge affects his or her skills in using digital tools, analytical thinking, ability to interpret data, and independence in research activity. In turn, a higher level of mastery of digital technologies expands the possibilities of applying statistical methods to applied geographical data. Therefore, it is advisable to study the digital and statistical components not in isolation from each other, but as interacting parts of a single integrative competence.

Drawing on V.G. Afanasyev's views on systems analysis [17], the following aspects of studying digital-statistical competence in geography master's students were identified. The elemental aspect involves identifying the constituent parts of the competence and their content elements. The structural aspect reveals the mutual arrangement and interdependence of the components and their place within a single structure. The functional aspect defines the functions that the competence and its components perform in the master's student's academic, research and professional activities. The communicative aspect establishes the relationship of this competence with geographical, cartographic, geoinformational, methodological and research competencies. The integrative aspect reveals the mechanisms by which digital and statistical knowledge, practical skills and professional experience merge into a single competence. The historical aspect is aimed at analysing the stages of formation, current state and development trends of statistical and digital training in geography education.

Conclusion

The analysis made it possible to draw the following conclusions. First, research by Uzbek scholars on geography teaching methodology, cartography,



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geoinformatics, and economic and population geography has created a solid theoretical foundation for developing digital-statistical competence. Second, the issue of forming master's students' digital and statistical training as a single integrative competence has not yet been sufficiently studied as an independent pedagogical problem. Third, the systems approach provides a methodological basis for studying this competence as an integral pedagogical system in its elemental, structural, functional, communicative, integrative and historical aspects. In future research, it is advisable to develop a model, pedagogical conditions and diagnostic criteria for developing digital-statistical competence and to validate them through experimental work.

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