



MEDICAL GEOGRAPHY” COURSE AS A MEANS OF DEVELOPING DIGITAL-STATISTICAL COMPETENCE OF MASTER’S STUDENTS IN GEOGRAPHY: METHODOLOGICAL FOUNDATIONS

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Abstract

The article analyses the qualification requirements of the master’s speciality 70530201 - Geography and the content of the “Medical Geography” course syllabus from the perspective of digital-statistical competence. Digital-statistical competence is substantiated as an integrative professional quality that enables searching, organising, statistically processing, modelling, visualising, and scientifically interpreting geographic data. A methodological model is proposed based on interactive, research and project methods and on the progressive use of MS Excel, MS Access, MATLAB, C++ and GIS.

Keywords: Digital-statistical competence, medical geography, master of geography, interactive methods, statistical analysis, GIS, modelling.

Introduction

Today, geographic research increasingly relies on large volumes of digital data, statistical indicators and geoinformation technologies. The Concept for the Development of the Higher Education System of the Republic of Uzbekistan until 2030 sets as priority tasks the updating of educational content in line with modern requirements, the development of practical skills and the improvement of the quality of personnel training [13]. The “Digital Uzbekistan – 2030” strategy, in turn, envisages the wide introduction of digital technologies in all sectors of the economy and the social sphere, including education [14]. Under these conditions, the ability of master’s students in geography to search for data in a digital environment, process it statistically and interpret it at the territorial

 WORLD BULLETIN PUBLISHING Online Publishing Hub	World Bulletin of Education and Learning (WBEL)
ISSN (E): 3072-175X	Volume 2, Issue 5, May 2026
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https://worldbulletin.org/index.php/1	

level is becoming an important factor determining their professional competitiveness.

Medical geography, which studies population health, the territorial differentiation of morbidity and access to medical services, holds a special place in this respect. Since the object of this discipline consists of multifactorial processes expressed through quantitative indicators, its teaching creates a favourable didactic environment for developing digital-statistical competence.

The theoretical and methodological foundations of medical geography and the spatial patterns of health and disease have been covered in the works of M.S. Meade and M. Emch [10], A.C. Gatrell and S.J. Elliott [6], and T. Koch [8]. The application of GIS and spatial analysis methods in public health has been systematically presented by E.K. Cromley and S.L. McLafferty [2], quantitative geography and spatial data analysis by A.S. Fotheringham and co-authors [3], and the fundamentals of geographic information science by P.A. Longley et al. [9]. The problems of developing statistical literacy and statistical reasoning have been addressed by I. Gal [4] and J. Garfield and D. Ben-Zvi [5], while the structure of digital competence has been elaborated within the European Union's DigComp 2.2 framework [15]. Spatial thinking and the use of GIS technologies in geography education have been investigated by S.W. Bednarz and K. Kemp [1], J.J. Kerski [7], and in a report of the U.S. National Research Council [12]. The idea of integrating technology, pedagogy and content knowledge was substantiated by P. Mishra and M.J. Koehler [11]. However, the development of digital and statistical skills of master's students in geography as a single integrative competence through the content of the "Medical Geography" course has not yet been sufficiently studied.

The aim of the study is to provide a scientific and methodological rationale for a system of forms, methods and means of instruction aimed at developing the digital-statistical competence of master's students in geography, based on an analysis of the qualification requirements of the master's specialty 70530201 – Geography and the content of the "Medical Geography" course syllabus.

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ISSN (E): 3072-175X	Volume 2, Issue 5, May 2026
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Research methodology

The study employed content analysis of regulatory documents and curricula, comparative analysis, a systems approach and generalisation. The objects of analysis were the qualification requirements and the sections of the “Medical Geography” syllabus concerning learning outcomes, the content of practical classes and professional competencies.

Analysis and results

An analysis of the qualification requirements shows that training a modern master of geography is not limited to deepening theoretical knowledge but also requires the ability to search for, collect, process, model and scientifically interpret data. The fact that the Statistics Agency and its territorial divisions are listed among the graduate’s professional fields confirms the direct professional importance of being prepared to work with statistical data.

The document requires the master’s graduate to conduct scientific and applied research, process experimental results, search for targeted information in online sources, monitor processes using modern information technologies, assess and forecast natural geographic processes, and determine and model the dynamics and dimensions of geosystems. The tasks of analysing social processes in territories, identifying the population’s needs for services and developing mathematical models call for selecting and grouping statistical indicators, analysing time series, identifying interrelationships and presenting results in graphic and cartographic form. Without electronic databases and software analysis tools, the capacity to process large volumes of territorial, demographic and environmental information efficiently is limited [15].

The qualification requirements contain sufficient regulatory grounds for digital-statistical competence, yet they are not systematised as a separate competence model. It is therefore appropriate to interpret digital-statistical competence as an integrative professional quality that enables searching for, organising, statistically processing, modelling, visualising and interpreting geographic data in a digital environment, and producing scientifically grounded conclusions and forecasts on that basis [4; 5].

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The “Medical Geography” syllabus provides an important subject base for working with quantitative data. Its learning outcomes include developing nosogeographic forecasts based on statistical indicators of diseases, registry data, demographic and medical surveys, and statistical and mathematical methods [6; 10]. Comparing territories on the basis of statistical indicators, assessing the provision of medical services and analysing the geography of morbidity foster data-driven geographic thinking in master’s students [3]. However, the digital component of the syllabus is not sufficiently specified. Retrieving data from electronic databases, processing it in specialised software, digital visualisation and integration with GIS are not defined as distinct competencies [2]. Therefore, tasks focused on working with electronic statistical databases, cleaning and grouping data, graphic and cartographic visualisation and the scientific interpretation of results should be systematically incorporated into the practical content of the course.

The main criterion for selecting teaching methods in this course is transforming the master’s student from a passive recipient of ready-made knowledge into an active researcher who searches for, analyses and evaluates medical-geographic information and draws scientific conclusions [1; 12]. Passive methods are effective for the systematic presentation of theoretical concepts, active methods for independent processing of knowledge, and interactive methods for collaborative analysis of statistical data and evidence-based argumentation of scientific positions.

The FSMU method enables the student to move from merely recording a numerical result to revealing its causal and territorial meaning. For example, a statement about the high share of cardiovascular diseases in a particular area is supported by statistical evidence, demographic, environmental or socio-economic factors, and a geographic generalisation. The SCAMPER method helps develop innovative, data-based solutions to problems such as locating prevention centres and identifying risk groups, while the cluster method helps students perceive the concept of “population health” as a system of factors linked to age structure, urbanisation, environmental conditions, income, migration and medical infrastructure. Sketching and visual modelling combine tables, charts, map schemes and infographics into a single visual logic.

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The research method is organised as the sequence problem - data - digital processing - statistical analysis - visualisation - geographic interpretation - scientific conclusion [5]. The project method completes this activity with practical products such as “Medical-geographic passport of a territory”, “Digital map of morbidity” and “Relationship between environmental risk and population health”.

Digital tools are applied in a system of progressively increasing complexity [11].

As a basic tool, MS Excel allows students to sort data, calculate relative and absolute indicators, the mean, standard deviation and correlation, perform territorial grouping with PivotTables and create charts. MS Access serves to manage data on territories, disease types, medical institutions and numbers of physicians through linked tables and queries. MATLAB is used for time series, correlation and regression relationships, trends and the development of forecasting models [3]. The C++ programming language develops algorithmic thinking through the creation of custom data-processing algorithms.

Integrating these tools with GIS technologies yields a particular pedagogical effect: presenting morbidity rates calculated in MS Excel or MATLAB as choropleth or thematic maps makes it possible to identify territorial disparities visually and to interpret their causes more deeply [2; 7; 8; 9]. The forms of instruction are also closely linked with methods and tools. Lectures develop the theoretical foundations, practical and laboratory classes develop work with real data, seminars develop the discussion of results, and independent study and projects develop individual research activity. The system of forms, methods and means of teaching the “Medical Geography” course is shown in Figure 1.

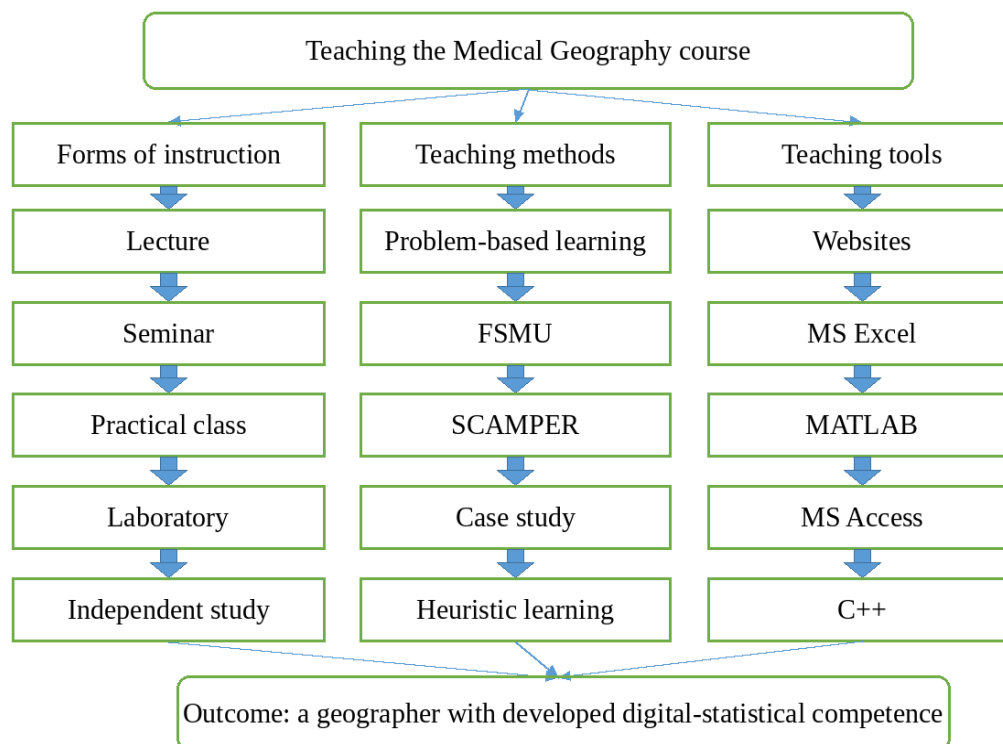


Figure 1. Forms, methods and means of instruction

The student's digital-statistical activity thus develops step by step from simple software operations to searching for data, entering it into a database, cleaning, statistical processing, modelling, visualisation, geographic interpretation and forecasting.

Conclusion

The analysis showed that the qualification requirements of the master's specialty 70530201 – Geography contain the necessary regulatory grounds for developing digital-statistical competence, but these requirements are not systematised as a single competence model. The "Medical Geography" course, in turn, provides a rich subject base for developing such competence through statistical indicators, registry data and nosogeographic forecasting tasks.

To develop digital-statistical competence effectively, it is advisable to combine problem-based, interactive, research and project methods with MS Excel, MS Access, MATLAB, C++ and GIS tools in a system of progressively increasing

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ISSN (E): 3072-175X	Volume 2, Issue 5, May 2026
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complexity. The proposed methodological model makes it possible to organise the student's activity across the full research cycle, from searching for data to producing scientifically grounded conclusions and forecasts.

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ISSN (E): 3072-175X	Volume 2, Issue 5, May 2026
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