



METHODOLOGY FOR ORGANIZING INTERDISCIPLINARY INTEGRATION IN GEOGRAPHY EDUCATION BASED ON THE STEAM APPROACH

Surayyo Abdusalomovna Haydarova

*Associate Professor, Department of Geography, JSPU
Jizzakh, Uzbekistan*

Nilufar Erkinova

*Student of Geography and Fundamentals of Economic Knowledge
JSPU
Jizzakh, Uzbekistan*

ABOUT ARTICLE

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Abstract: This article analyzes the methodological opportunities for organizing interdisciplinary integration in geography education based on the STEAM approach.

In Uzbekistan's education system, increasing attention is being paid to the competency-based approach, digital education, and practice-oriented teaching. However, clear methodological mechanisms for the systematic organization of STEAM-based interdisciplinary integration in geography lessons have not yet been sufficiently developed. Therefore, this article highlights the methodological foundations of applying the STEAM approach in geography education, the stages of its use in the lesson process, and the criteria for designing educational tasks.

STEAM YONDASHUVI ASOSIDA GEOGRAFIYA TA'LIMIDA FANLARARO INTEGRATSIYANI TASHKIL ETISH METODOLOGIYASI

Surayyo Abdusalomovna Haydarova

*JSPU Geografiya kafedrasi dotsenti
Jizzax, Uzbekistan*

Nilufar Erkinova

*JSPU Geografiya va iqtisodiy bilim asoslari yo'nalishi talabasi
Jizzax, Uzbekistan*

MAQOLA HAQIDA

Kalit soʻzlar: STEAM yondashuvi, geografiya taʼlimi, fanlararo integratsiya, kompetensiyaviy taʼlim, GIS, loyiha metodi, ekologik taʼlim.

Annotatsiya: Ushbu maqolada geografiya taʼlimida STEAM yondashuvi asosida fanlararo integratsiyani tashkil etishning metodik imkoniyatlari tahlil qilinadi.

Oʻzbekiston taʼlim tizimida kompetensiyaviy yondashuv, raqamli taʼlim va amaliyotga yoʻnaltirilgan oʻqitishga tobora koʻproq eʼtibor qaratilmoqda. Biroq geografiya darslarida STEAM asosidagi fanlararo integratsiyani tizimli tashkil etishning aniq metodik mexanizmlari hali yetarli darajada ishlab chiqilmagan. Shu sababli, maqolada geografiya taʼlimida STEAM yondashuvini qoʻllashning metodologik asoslari, uni dars jarayonida qoʻllash bosqichlari hamda taʼlimiy topshiriqlarni loyihalash mezonlari yoritilgan.

МЕТОДОЛОГИЯ ОРГАНИЗАЦИИ МЕЖДИСЦИПЛИНАРНОЙ ИНТЕГРАЦИИ В ГЕОГРАФИЧЕСКОМ ОБРАЗОВАНИИ НА ОСНОВЕ STEAM-ПОДХОДА

Сурайё Абдусаломовна Хайдарова

Доцент кафедры географии JSPU

Джизак, Узбекистан

Нилуфар Эркинова

Студентка направления «География и основы экономических знаний» JSPU

Джизак, Узбекистан

О СТАТЬЕ

Ключевые слова: STEAM-подход, географическое образование, междисциплинарная интеграция, компетентностное образование, ГИС, метод проектов, экологическое образование.

Аннотация: В данной статье анализируются методические возможности организации междисциплинарной интеграции в географическом образовании на основе STEAM-подхода.

В системе образования Узбекистана все большее внимание уделяется компетентностному подходу, цифровому образованию и практико-ориентированному обучению. Однако четкие методические механизмы системной организации междисциплинарной интеграции на основе STEAM на уроках географии до настоящего времени разработаны недостаточно. В связи с этим в статье освещаются методологические основы применения STEAM-подхода в географическом образовании, этапы его использования в учебном процессе, а также

In modern education, the value of the knowledge acquired by a learner is determined not only by their ability to remember it, but also by their ability to apply it in different situations, analyze evidence and numerical data, identify the causes of problems, and propose solutions. Therefore, alongside teaching subjects separately, revealing their meaningful interconnections is becoming an important methodological task for contemporary geography education.

Geography is inherently integrative in its content: it studies phenomena such as the Earth's crust, climate, water, soil, population, economy, transport, ecology, and territorial development in their interrelation. For example, when explaining climate change, the laws of physics, the composition of gases in the atmosphere, the state of biological systems, the impact of economic activity, and statistical indicators are analyzed together. Thus, an interdisciplinary approach in geography lessons is not an external addition, but a necessity arising from the very nature of the subject.

The STEAM approach strengthens precisely this opportunity in geography education. The Science component serves to provide a scientific explanation of natural processes; Technology supports the use of digital maps and GIS tools; Engineering helps develop practical projects for problematic situations; Arts enables the expression of ideas through maps, infographics, and visual interpretation; and Mathematics supports statistical calculations, tables, diagrams, and modeling.

In research on STEAM education, interdisciplinary connection is interpreted as an important factor that ensures learners' holistic understanding of knowledge and their ability to transfer it into practical activity. G. Yakman interprets STEAM as an integrated system of science, technology, engineering, arts, and mathematics. R. Bybee emphasizes the special role of the STEM/STEAM approach in developing twenty-first-century skills. T. Kelley and J. Knowles substantiate that problem situations, project-based activity, and practical outcomes occupy a central place in integrated STEM education.

In views on integrated curricula, it is also emphasized that the main goal is not to combine content artificially, but to unite it around a common problem, phenomenon, or project. This approach is especially suitable for geography education: topics such as environmental security, urbanization, water resources, climate change, transport systems, and territorial development cannot be fully explained within the framework of a single subject. They require study at the intersection of natural, social, economic, and technological factors.

Local pedagogical literature discusses issues related to innovative educational technologies, the competency-based approach, and the modernization of geography education. Nevertheless, the step-by-step application of STEAM components in geography lessons, the interdisciplinary design

of tasks, and the determination of assessment criteria still require separate methodological research.

In geography lessons, the STEAM approach should not be limited to naming each component separately. Its effectiveness depends on how these components are connected with the lesson objectives and learning activities. For example, in the topic of “Climate Change,” learners analyze temperature indicators, construct graphs, identify cause-and-effect chains, create a territorial risk map, and propose adaptation measures. In this process, elements of mathematics, physics, ecology, technology, and design are integrated into a single learning process.

Table 1

Application of STEAM Components in Geography Education

STEAM Component	Content in Geography Lessons	Learner Activity	Expected Outcome
Science	Climate, biosphere, soil, water, natural resources	Observation, explaining cause-and-effect relationships, providing evidence	Scientific thinking and environmental literacy
Technology	GIS, electronic maps, online databases	Creating maps, searching for information, and presenting it digitally	Digital and cartographic competence
Engineering	Designing practical solutions for territorial problems	Proposing a model, prototype, or project	Ability to solve problem situations
Arts	Map design, infographics, visual storytelling	Presenting information in an aesthetic and understandable form	Creative thinking and communication
Mathematics	Statistics, percentages, ratios, diagrams, forecasting	Calculating, creating graphs, comparing	Analytical thinking and evidence-based reasoning

When organizing a STEAM-based geography lesson, the first priority is not to select a topic, but to identify a problem. The problem should be understandable for learners and have territorial relevance. For example, questions such as “How can the efficiency of water use in the local area be improved?”, “What factors influence the greenhouse effect in cities?”, and “How does population density affect the transport network?” direct the lesson toward inquiry-based activity.

At the second stage, the problem is connected with STEAM components. Learners scientifically explain natural processes, calculate statistical data, create maps or diagrams, design solutions, and defend their results in a visual form. In such a lesson, the teacher does not act merely as a provider of ready-made information, but performs the role of a methodological organizer who guides learning activities, clarifies questions, and defines assessment criteria.

At the third stage, the result is assessed. Assessment should focus not only on the final answer, but also on the validity of evidence, the quality of data use, the accuracy of maps or

diagrams, cooperation within the group, and the practical significance of the proposed solution. In this way, the geography lesson is directed not toward reproducing knowledge, but toward making decisions based on knowledge.

In geography education, the STEAM approach can be effectively implemented through the following types of tasks:

- analyzing a local environmental problem based on a cause-and-effect chain;
- creating tables and diagrams based on climate indicators;
- assessing the efficiency of natural resource use according to economic and environmental criteria;
- creating a thematic map of a specific area using GIS or electronic mapping tools;
- developing a small-scale project on water, waste, green spaces, or transport problems;
- presenting data in the form of an infographic and defending the proposed solution with evidence.

Such tasks develop learners' ability to connect geographical knowledge with the content of other subjects, express ideas based on numbers and maps, process information obtained from different sources, and justify their own solutions. Most importantly, the task should be directly related to the topic, have a measurable outcome, and require learners to make independent decisions.

Analysis shows that the main advantage of applying the STEAM approach in geography education is that it turns interdisciplinary connections into an internal part of the lesson content. In the traditional approach, learners often master the topic through theoretical definitions. In STEAM-based integration, however, the topic is enriched with observation, calculation, mapping, designing, and presentation. As a result, learners understand a geographical process not in a one-sided way, but as a unity of various factors.

At the same time, there are certain methodological limitations in introducing the STEAM approach. In particular, not all topics can be adapted to the STEAM format at the same level; the teacher is required to have a solid understanding of digital tools, the project method, and assessment criteria; and in conditions of limited lesson time, it is necessary to determine the scope of tasks correctly. Therefore, the STEAM approach becomes effective only when it is applied not as a separate activity, but in harmony with the topic, objective, tools, and assessment.

In the context of Uzbekistan, it is especially important to enrich this approach with local geographical materials. For example, topics such as the transport system, economy, and climatic risks provide opportunities to create integrative tasks that are familiar to learners and have practical significance.

In conclusion, organizing interdisciplinary integration in geography education based on the STEAM approach serves to develop learners' knowledge in a systematic, practical, and evidence-based way. The integrative nature of geography creates broad methodological opportunities for applying this approach. In particular, topics such as environmental problems, climate change, the use of natural resources, urbanization, and territorial development are among the most suitable themes for STEAM-based teaching.

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