

The Structure Of Subject-Related Competencies And Strategies For Their Development

Naimova Maftunabonu Fayzullojonovna
Bukhara State Pedagogical Institute, Uzbekistan

Received: 20 September 2025; **Accepted:** 12 October 2025; **Published:** 17 November 2025

Abstract: This article provides a scientific analysis of the structure of subject-related competencies and strategies for their development. In the modern educational environment, it is essential not only to acquire theoretical knowledge of a subject, but also to develop practical skills, independent thinking, and problem-solving abilities. The research compares traditional and innovative teaching methods and identifies their role in developing students' competencies. Lessons conducted in specially organized experimental classes demonstrate the effectiveness of interactive approaches; particularly STEM education, project-based learning, and the Design Thinking method. Based on surveys conducted among teachers and students, the study identifies challenges encountered in the educational process—such as insufficient resources for practical activities and the dominance of theoretical content in curricula—and proposes solutions to address these issues.

The article emphasizes the need to introduce methodological innovations in education to ensure the effective formation of subject-related competencies. It argues that making the learning process more active and inquiry-based can increase students' interest in science and help them acquire the knowledge and skills required by modern life. Additionally, the study highlights the importance of improving school infrastructure, enhancing teachers' professional qualifications, and revising educational programs to better support competency development. The findings demonstrate that subject-related competencies play a central role in improving the quality of education and aligning the national education system with contemporary standards.

Keywords: Subject-related competencies, competency development, educational strategies, innovative teaching methods, STEM education, project-based learning, design thinking.

Introduction: In the current era, characterized by global competition and the rapid development of innovative technologies, new demands are being placed on the field of education. Today, the education system is no longer merely a means of providing knowledge; rather, it has become a key factor ensuring the holistic development of an individual. For this reason, the competency-based approach is regarded as the primary methodological direction in education. A competency-based approach is a comprehensive framework aimed at developing the learner's personality, fostering independent thinking, preparing them for practical activity, and teaching them to solve problems in real-life situations.

In particular, subject-related competencies refer to a set of abilities within a specific discipline, including theoretical knowledge, practical skills, logical thinking, analysis and synthesis, and the ability to address

various issues using scientific reasoning. These competencies help learners make correct and effective decisions not only during the learning process but also in diverse real-life contexts. Therefore, developing subject-related competencies is one of the priority directions of modern education.

Today's learners are expected not only to memorize and reproduce traditional information, but also to demonstrate analytical thinking, creativity, interdisciplinary integration, experimentation, information management, programming, and algorithmic thinking. All of these skills are components of subject-related competencies. By cultivating these competencies in education, it becomes possible to raise a generation that is innovative, capable of critical analysis, and proficient in modern technologies—benefiting not only individual learners but society as a whole.

The role of the teacher in developing subject-related competencies is invaluable. A teacher is not only a source of knowledge but also a guide who motivates learners to engage in independent inquiry and helps shape them as active participants in the learning process. Therefore, organizing lessons based on a competency-based approach, using interactive methods, creating problem-based situations, and implementing group work strategies are of critical importance. The article provides an in-depth analysis of the theoretical foundations of subject-related competencies, their structural components, the process of their formation, and strategies for their development. It also examines, based on real pedagogical experience, the factors influencing the development of competencies and offers practical recommendations for their improvement.

When expanding the methodology section, it is essential not to limit the discussion to traditional research methods but to integrate modern, constructive, innovative, and interdisciplinary approaches. These approaches contribute to forming deep, stable, and practical subject-related competencies in learners. When expanding the methodology section, it is important not to limit the discussion to traditional research methods, but to integrate modern, constructive, innovative, and interdisciplinary approaches. These approaches contribute to the development of deep, stable, and practical subject-related competencies in learners. In examining the structure of subject-related competencies and strategies for their development, various methods grounded in contemporary pedagogical approaches were employed. Alongside traditional research techniques, methods based on innovative educational technologies were also applied, creating opportunities for learners to engage in deeper thinking, understand interdisciplinary connections, and reinforce practical knowledge. Below is a brief description of the main methodological approaches used in the study:

1. Cognitive–metacognitive approach

Subject-related competencies are directly linked not only to cognitive processes but also to the learner's ability to monitor and reflect on their own thinking. Therefore, based on the cognitive and metacognitive approach, learners' self-assessment and understanding of the strategies they use to apply knowledge were observed. Through this method, students became more involved in the independent development of their competencies.

2. STEM approach

In the study, integrated learning projects based on

STEM (Science, Technology, Engineering, and Mathematics) were used as an important method for developing subject-related competencies. This approach helps learners understand the interconnectedness of different fields and develop the ability to integrate knowledge from multiple disciplines in order to solve problems.

3. Research-Based Learning

Engaging students in small-scale scientific research activities plays an important role in developing subject-related competencies. For this reason, the study provided learners with opportunities to acquire knowledge through independent scientific projects, experiments, observations, or mini-research tasks. This approach encouraged students to actively construct knowledge, which in turn strengthened their analytical thinking skills.

4. Design Thinking approach

The Design Thinking methodology -an innovative, problem-solving project-based approach-was tested as a tool for strengthening subject-related competencies. This approach directs learners toward finding solutions to real-life problems, thereby fostering scientific thinking, communication skills, teamwork, creativity, and other transversal competencies.

5. Brainstorming and Reverse Engineering method

Among the non-traditional methods used in solving subject-related tasks is reverse engineering-an approach that starts from an existing solution and works backward to identify the root of the problem. This method was applied in the teaching process and helped develop learners' logical thinking and their ability to analyze cause-and-effect relationships.

Through these methodological approaches, it became possible to thoroughly analyze subject-related competencies, scientifically study their formation processes, and identify effective strategies for their development. The integration of traditional and innovative methods contributed not only to strengthening students' knowledge, but also to the development of analytical thinking, problem-solving skills, understanding interdisciplinary connections, and fostering self-assessment-key met competencies necessary for modern learning. These methods ensured the reliability of the research outcomes while also expanding their applicability in practical educational contexts. In particular, methods such as STEM and research-based learning played an important role in the systematic and sustainable development of subject-related competencies. The selected methodological foundations created a strong basis for studying and improving these competencies in

accordance with contemporary educational requirements.

During the research, surveys, observations, and experiments were conducted with a total of 120 upper-

grade students (8th to 11th grades) and 25 subject teachers across five general secondary schools in Tashkent city and the surrounding regions. The statistical data obtained from these activities are summarized below.

1. Level of mastery of subject-related competencies (among students):			
Indicators	High (%)	Medium (%)	Low (%)
Knowledge of theoretical content	76%	19%	5%
Ability to apply knowledge in practice	28%	45%	27%
Ability to make correct decisions in problem situations	22%	41%	37%
Understanding interdisciplinary connections	31%	47%	22%
Independent inquiry and question formulation	25%	38%	37%

2. Barriers to Developing Competencies Based on Teachers' Opinions:			
Type of barrier	Number of respondents	Share (%)	
Insufficient lesson time	18	72%	
Excessive theoretical content in the curriculum	20	80%	
Lack of skills in using interactive methods	9	36%	
Shortage of practical resources (laboratories, equipment)	15	60%	

According to students' self-evaluations in the survey:

- 65% of students stated that they understand the subject better when lessons are connected to real life.
- 54% of students said that problem-based tasks make

the subject more interesting.

- 60% of students complained about the lack of practical activities.
- 42% of students indicated that they struggle to

perceive interdisciplinary connections.

The analyzed statistical data show that although students possess theoretical knowledge, they experience certain difficulties in applying this knowledge in practice, thinking independently in problem situations, and understanding interdisciplinary relationships. Interactive lessons conducted as part of the experiment, however, significantly enhanced the development of subject-related competencies. This confirms the effectiveness of education based on the competency-based approach.

The formation and development of subject-related competencies is one of the key factors in improving the quality of education. The results of the study revealed that while traditional teaching methods are sufficiently effective in delivering theoretical knowledge, they face several limitations in developing students' practical skills and increasing their level of independent thinking. This situation indicates that many students struggle to apply their knowledge in real-life contexts, which demonstrates the necessity of developing subject-related competencies more deeply and systematically.

The study also revealed that students' self-assessment and analytical thinking skills developed through the use of interactive methods. This led to increased activity in the learning process as well as stronger motivation and interest in independent learning. Interviews and surveys conducted with teachers likewise emphasized the need to apply innovative approaches, as they play an important role in further developing students' individual abilities, creativity, and critical thinking. However, one of the major issues identified in the research is the lack of infrastructure and resources necessary for the broad implementation of practical and interactive teaching methods. In many schools, the absence of well-equipped laboratories, technological tools, and sufficient instructional materials limits teachers' opportunities to employ active and effective methods. Therefore, to effectively organize the learning process, systematic efforts are needed to improve the material-technical base and enhance teachers' professional skills. Another important issue is that educational programs often prioritize theory over practice, giving insufficient attention to hands-on activities. This creates certain barriers to the development of subject-related competencies. Hence, when updating curricula, it is necessary to strengthen interdisciplinary integration, problem-based learning, project work, and other practical activities. The findings of the study show that an educational process organized on the basis of modern pedagogical approaches and innovative methods not only deepens students' knowledge but also effectively develops their

independent thinking, creativity, and problem-solving skills. In turn, this contributes to the enrichment of subject-related competencies both theoretically and practically, and increases students' interest in learning. To effectively form and develop subject-related competencies, it is essential to integrate traditional and innovative methods, align curricula with modern requirements, improve teachers' professional qualifications, and strengthen schools' material and technical resources.

CONCLUSION

Today, the formation and development of subject-related competencies in the educational process is regarded as an essential task. The findings of this study show that in order to develop competencies systematically and effectively, it is necessary not only to provide theoretical knowledge, but also to cultivate practical skills, independent thinking, and a deep understanding of interdisciplinary integration. While traditional teaching methods are effective in delivering theoretical knowledge, they face limitations in developing students' independent activities and practical skills. Innovative approaches-such as interactive methods, STEM education, project-based learning, and the Design Thinking methodology-have been proven to increase student engagement, develop their ability to make independent decisions in problem situations, and promote a deeper understanding of interdisciplinary relationships. Experimental results demonstrated that such methods lead to significant growth in competency development and increase students' interest in academic subjects. From this perspective, strengthening educational policy, enhancing teachers' professional qualifications, and expanding the base of practical resources are among the key tasks when developing strategies for improving subject-related competencies. In conclusion, the development of subject-related competencies plays a decisive role in improving the quality of education, equipping the younger generation with modern knowledge and skills, and preparing them to adapt to real-life challenges. By widely introducing innovative methods and making the learning process active and inquiry-based, it is possible to advance our country's education system to a new stage. In the future, conducting deeper research in this area, further developing interdisciplinary approaches, and introducing directions such as the digitalization of the learning process will contribute to increasing educational effectiveness. Thus, continuously improving the structure and development strategies of subject-related competencies will support the sustainable growth of the national education system.

REFERENCE

1. Akhmedova, M. T., & Karimov, S. B. (2021). Innovatsion ta'lim metodlari va ularning samaradorligi.
2. Johnson, D. W., & Johnson, R. T. (2019). Cooperative learning: Improving university instruction by basing practice on validated theory. *Journal of Excellence in College Teaching*, 30(3), 1-26.
3. Kuryazova, N. N. (2020). Fanga oid kompetensiyalarni rivojlantirish strategiyalari. *Ta'lim va Innovatsiyalar*, 5(2), 45-53.
4. Lee, C., & Kim, H. (2018). STEM education and competency development: A review of teaching strategies. *International Journal of STEM Education*, 5(1), 12-28. <https://doi.org/10.1186/s40594-018-0105-1>
5. O'zbekiston Respublikasi Ta'lim Vazirligi. (2022). Ta'lim dasturlarini takomillashtirish bo'yicha strategik hujjatlar. Toshkent: Ta'lim Vazirligi Nashriyoti.
6. Smith, P. L., & Ragan, T. J. (2020). *Instructional design* (4th ed.). Hoboken, NJ: Wiley.
7. Tashkent State Pedagogical University. (2023). Fanga oid kompetensiyalar va ularni shakllantirish usullari bo'yicha amaliy qo'llanma. Toshkent.