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MODERN METHODS OF FORMING META-SUBJECT COMPETENCIES IN PRIMARY EDUCATION

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Abstract

The transition from knowledge-based education to competency-based learning has significantly transformed the objectives of primary education worldwide. Contemporary educational systems increasingly emphasize the development of learners' meta-subject competencies, which enable students to transfer knowledge, solve complex problems, think critically and creatively, communicate effectively, and regulate their own learning across different subject areas. These competencies have become fundamental indicators of educational quality and are reflected in international assessment frameworks such as PISA, TIMSS, and the OECD Learning Compass 2030. Consequently, preparing future primary school teachers to design learning environments that foster meta-subject competencies has become one of the major challenges of teacher education.

This study examines modern pedagogical methods used to develop meta-subject competencies in primary education through a comprehensive analysis of international and national research. Particular attention is paid to competency-based instruction, problem-based learning, project-based learning, inquiry-based learning, STEAM education, collaborative learning, and digital educational technologies. The research applies theoretical analysis, comparative review, and content analysis to identify the pedagogical potential of these instructional approaches and their contribution to the development of universal learning competencies.

The findings indicate that effective formation of meta-subject competencies requires an integrated instructional model combining innovative pedagogical strategies, interdisciplinary learning, formative assessment, and technology-enhanced instruction. The study also argues that future primary school teachers should acquire methodological competence in designing competency-oriented learning activities capable of promoting higher-order thinking skills and lifelong learning. The proposed recommendations may contribute to improving teacher education curricula and enhancing the quality of competency-based primary education.

Keywords: meta-subject competencies, competency-based education, primary education, future primary school teachers, interdisciplinary learning, project-based learning, inquiry-based learning, STEAM education, digital pedagogy, critical thinking.

Introduction

The rapid development of the knowledge society, digital transformation, and globalization has fundamentally changed the expectations placed upon modern education systems. Contemporary schools are expected not only to provide learners with subject-specific knowledge but also to develop universal competencies that enable them to adapt to continuously changing social, economic, and technological environments. Consequently, educational reforms implemented in many countries have shifted from knowledge-oriented instruction toward competency-based

education, where learning outcomes are measured by learners' ability to apply knowledge creatively, solve authentic problems, communicate effectively, and continue learning throughout life.

Within this context, the concept of **meta-subject competencies** has attracted increasing attention in educational research. Unlike traditional subject competencies, meta-subject competencies represent transferable cognitive, communicative, social, and self-regulatory abilities that can be applied across different disciplines and real-life situations. These competencies include critical thinking, creativity, collaboration, communication, information literacy, self-directed learning, reflection, and problem-solving. Their development enables learners to integrate knowledge acquired from various school subjects while responding effectively to complex educational and social challenges.

International educational organizations emphasize the importance of these competencies as essential learning outcomes for the twenty-first century. The OECD Learning Compass 2030 identifies student agency, transformative competencies, and lifelong learning as the main objectives of contemporary education. Similarly, UNESCO highlights critical thinking, creativity, collaboration, and responsible citizenship as indispensable competencies for sustainable development. International large-scale assessment programs, including PISA and TIMSS, increasingly evaluate learners' ability to transfer knowledge, analyze unfamiliar situations, and solve interdisciplinary problems rather than merely reproduce factual information.

These international trends have significantly influenced educational reforms in the Republic of Uzbekistan. Recent modernization of the national education system has introduced competency-based curricula, renewed state educational standards, learner-centred pedagogical approaches, digital learning technologies, and interdisciplinary integration. These reforms require primary school teachers to possess not only strong subject knowledge but also methodological competence in organizing educational activities that promote the development of learners' meta-subject competencies.

Despite considerable progress in curriculum modernization, one important issue remains insufficiently addressed. Existing instructional practice often continues to prioritize reproduction of subject knowledge, while limited attention is devoted to developing transferable competencies through innovative pedagogical methods. Moreover, teacher education programs frequently emphasize theoretical preparation without providing future teachers with sufficient methodological experience in designing competency-oriented lessons. As a result, a discrepancy exists between contemporary educational requirements and the professional readiness of future primary school teachers to develop meta-subject competencies among young learners.

This contradiction determines the relevance of the present study. Addressing this challenge requires identifying modern pedagogical methods that effectively support competency-oriented instruction while simultaneously improving teacher preparation. Consequently, the purpose of this article is to analyze contemporary instructional approaches used in primary education and determine their methodological potential for developing learners' meta-subject competencies within competency-based educational environments.

Literature Review

The concept of competence has evolved considerably over recent decades. Early studies conducted by McClelland (1973) shifted educational attention from intelligence testing toward competency-based performance. Raven (1984) further conceptualized competence as an integrated combination of knowledge, skills, values, and motivation required for successful professional and social activity. Perrenoud (2002) extended this perspective by emphasizing teachers' ability to

organize authentic learning situations that encourage learners to mobilize knowledge in solving practical problems.

Research concerning meta-subject competencies emerged primarily within competency-based educational paradigms and interdisciplinary learning theories. Educational researchers argue that modern schooling should develop learners' capacity to transfer knowledge across disciplinary boundaries instead of treating school subjects as isolated domains of knowledge. According to Hattie (2023), effective learning occurs when students actively construct knowledge through inquiry, reflection, collaboration, and feedback rather than passive memorization. Similarly, Fullan (2020) identifies creativity, critical thinking, collaboration, communication, citizenship, and character as essential global competencies required for successful participation in twenty-first-century societies.

Recent studies increasingly associate the formation of meta-subject competencies with learner-centred pedagogies. Project-Based Learning, Inquiry-Based Learning, Problem-Based Learning, and STEAM education have demonstrated significant positive effects on students' higher-order thinking, motivation, creativity, collaboration, and self-regulated learning. Bell (2010) argues that project-based instruction provides authentic contexts where learners naturally integrate knowledge from different disciplines while developing communication and leadership skills. Likewise, Hmelo-Silver (2004) concludes that problem-based learning enhances conceptual understanding by engaging students in collaborative investigation of meaningful problems.

The rapid expansion of digital technologies has introduced additional opportunities for competency development. Mishra and Koehler's Technological Pedagogical Content Knowledge (TPACK) framework emphasizes that effective teaching requires the integration of technological, pedagogical, and subject knowledge. Contemporary digital learning environments facilitate independent information search, collaborative knowledge construction, personalized instruction, and continuous formative assessment, all of which contribute significantly to the development of meta-subject competencies.

Although international literature provides extensive evidence regarding competency-based education, relatively few studies examine these issues from the perspective of preparing future primary school teachers, particularly within the context of educational reforms in Uzbekistan. Existing national research mainly focuses on curriculum implementation and competency assessment, whereas methodological preparation for competency-oriented teaching remains insufficiently investigated. Therefore, further research is required to identify effective pedagogical methods capable of supporting both teacher preparation and learners' meta-subject competency development in primary education.

Results and Discussion

The development of meta-subject competencies has become one of the key priorities of modern primary education. Unlike traditional subject-oriented instruction, competency-based education focuses on equipping learners with universal skills that can be transferred across different disciplines and applied in various real-life situations. Consequently, the effectiveness of the educational process depends not only on the content of teaching but also on the selection and integration of pedagogical methods that encourage learners to think independently, solve problems creatively, communicate effectively, and regulate their own learning.

The analysis of contemporary pedagogical research indicates that learner-centred instructional approaches create favorable conditions for the formation of meta-subject competencies. In competency-based classrooms, learning activities are organized in a way that encourages students to explore, compare, analyse, evaluate, and synthesize knowledge rather than merely reproduce

information. Such educational environments support the development of higher-order thinking skills, which are considered fundamental components of meta-subject competence.

Among modern instructional approaches, problem-based learning occupies a central position because it places students in authentic situations requiring independent reasoning and evidence-based decision-making. Instead of receiving ready-made solutions, learners are encouraged to identify problems, formulate assumptions, evaluate alternative solutions, and justify their conclusions. This process not only improves subject understanding but also develops critical thinking, analytical reasoning, and self-regulated learning. Research findings suggest that students participating in problem-oriented activities demonstrate higher levels of motivation and deeper conceptual understanding than those taught through traditional explanatory methods.

Another significant approach is project-based learning, which integrates knowledge from different subject areas while promoting meaningful learning experiences. Through collaborative projects, learners investigate real-life issues, collect and analyse information, plan activities, distribute responsibilities, and present final outcomes. Such experiences strengthen communication skills, teamwork, creativity, responsibility, and independent learning. The interdisciplinary nature of project-based learning makes it particularly valuable for developing meta-subject competencies because students learn to connect concepts acquired in language, mathematics, science, and social studies within a single educational task.

Inquiry-based learning further contributes to the development of learners' investigative abilities by encouraging them to formulate questions, conduct observations, perform experiments, interpret evidence, and draw conclusions. Rather than relying exclusively on teacher explanations, students become active participants in the construction of knowledge. This instructional model develops curiosity, scientific literacy, reflective thinking, and information-processing skills. It also encourages learners to recognize that knowledge is generated through systematic investigation rather than passive memorization.

Recent educational reforms increasingly emphasize interdisciplinary integration through the implementation of STEAM education. The integration of science, technology, engineering, arts, and mathematics provides authentic contexts in which learners simultaneously apply knowledge from multiple disciplines to solve practical problems. Such activities stimulate creativity while strengthening logical reasoning, spatial thinking, engineering design skills, and collaborative problem-solving. For primary school learners, STEAM-based activities create opportunities to transform theoretical concepts into meaningful practical experiences, thereby facilitating the development of transferable competencies.

The rapid advancement of digital technologies has also transformed the educational environment and expanded opportunities for competency development. Digital educational platforms, multimedia resources, interactive simulations, virtual laboratories, and artificial intelligence applications support personalized learning and encourage learners to become independent users of information. Students learn not only how to search for information but also how to evaluate its reliability, organize digital resources, present findings effectively, and reflect on their own learning processes. Consequently, digital competence has become an essential component of meta-subject competence in twenty-first-century education.

Furthermore, collaborative learning plays a crucial role in fostering communication and social interaction. Working in small groups enables learners to negotiate ideas, exchange perspectives, resolve disagreements, and assume collective responsibility for achieving common goals. Such learning environments cultivate empathy, leadership, interpersonal communication, and conflict-resolution skills, all of which are regarded as important elements of meta-subject competence. The

teacher's role gradually changes from knowledge transmitter to facilitator, mentor, and organizer of meaningful learning experiences.

The effectiveness of these pedagogical approaches largely depends on their systematic integration rather than isolated implementation. No single instructional method can ensure comprehensive competency development. Instead, combining problem-based learning, inquiry-based activities, project work, collaborative learning, STEAM education, and digital technologies creates a holistic educational environment that supports learners' intellectual, social, emotional, and practical development. Such integration enables students to transfer acquired knowledge and skills across disciplines, which represents the essence of meta-subject competence.

The findings of this study indicate that successful implementation of modern pedagogical methods requires corresponding changes in teacher education. Future primary school teachers should possess not only subject knowledge but also methodological competence in designing competency-based lessons, selecting appropriate instructional strategies, organizing interdisciplinary learning activities, integrating educational technologies, and applying formative assessment techniques. Therefore, teacher preparation programs should provide greater opportunities for practice-oriented training, classroom simulations, action research, and reflective professional development.

The comparative analysis conducted within this study demonstrates that competency-oriented instructional approaches significantly enhance learners' cognitive engagement, motivation, creativity, communication, collaboration, and independent learning. These outcomes confirm that the systematic application of innovative pedagogical methods contributes directly to the development of meta-subject competencies, which are increasingly recognized as essential educational outcomes in national and international educational frameworks.

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