



**DEVELOPING STUDENTS' INTEGRATIVE
INTERDISCIPLINARY CRITICAL THINKING SKILLS THROUGH
THE CONCEPT MAPPING METHOD IN STEAM CLASSES
(BASED ON THE EXAMPLE OF SPECIALIZED SCHOOLS)**

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Abstract

This thesis examines the development of students' integrative interdisciplinary critical thinking skills through the implementation of the Concept Mapping method within the framework of STEAM education in specialized schools. The study analyzes the pedagogical potential of Concept Mapping as an effective instructional strategy for organizing knowledge structures, establishing logical relationships between interdisciplinary concepts, and enhancing students' cognitive activity. The research highlights the role of STEAM-based learning in promoting interdisciplinary integration, problem-solving abilities, analytical thinking, and creative approaches among students. The application of Concept Mapping allows learners to visualize connections between scientific concepts, develop independent reasoning skills, and construct meaningful knowledge networks. The findings demonstrate that integrating the Concept Mapping method into STEAM classes contributes to improving students' critical thinking, cognitive flexibility, and ability to apply interdisciplinary knowledge in solving complex problems. The study emphasizes the importance of innovative pedagogical approaches in specialized schools for preparing students with higher-order thinking skills required in modern educational environments.

Keywords: STEAM education, Concept Mapping method, interdisciplinary learning, integrative skills, critical thinking, cognitive development, specialized schools, problem-solving, innovative pedagogy.



INTRODUCTION

The rapid development of modern education requires the formation of students’ abilities not only to acquire knowledge but also to apply it in complex, interdisciplinary contexts. In this regard, STEAM education has become one of the most effective approaches for integrating science, technology, engineering, arts, and mathematics into a unified learning environment. This approach promotes students’ ability to analyze real-world problems, develop creative solutions, and apply knowledge from different disciplines.

In specialized schools, where students are expected to develop advanced intellectual and research-oriented abilities, the formation of integrative interdisciplinary critical thinking skills is of particular importance. Traditional teaching approaches often focus on the acquisition of separate subject knowledge, while modern educational requirements emphasize the necessity of connecting concepts across disciplines and developing higher-order thinking skills.

Concept Mapping is considered an effective pedagogical method for enhancing students’ cognitive activity and organizing interdisciplinary knowledge. Through visual representation of concepts and relationships between them, students can better understand complex systems, identify connections among different fields of knowledge, and develop analytical and reflective thinking skills. The method encourages active learning, independent reasoning, and meaningful knowledge construction.

The integration of Concept Mapping into STEAM classes creates opportunities for students to explore interdisciplinary problems, structure their ideas, and develop critical thinking through a systematic learning process. Therefore, investigating the role of Concept Mapping in developing students’ integrative interdisciplinary critical thinking skills in specialized schools represents a significant area of pedagogical research.



The aim of this study is to analyze the pedagogical potential of the Concept Mapping method in STEAM classes and to determine its effectiveness in developing students' integrative interdisciplinary critical thinking skills in specialized schools.

MAIN PART

STEAM education provides a meaningful framework for developing students' interdisciplinary thinking by combining knowledge from different academic fields. Unlike traditional subject-based instruction, the STEAM approach emphasizes the practical application of knowledge through inquiry, problem-solving, and project-based learning activities. In this learning environment, students are encouraged to examine complex issues from multiple perspectives and establish connections between scientific concepts.

The Concept Mapping method plays an important role in organizing and integrating interdisciplinary knowledge within STEAM classes. A concept map visually represents key concepts, their relationships, and hierarchical structures, allowing students to develop a deeper understanding of complex topics. By creating concept maps, learners actively analyze information, compare ideas, identify cause-and-effect relationships, and construct meaningful connections between different disciplines.

The use of Concept Mapping in specialized schools contributes to the development of critical thinking skills through several educational mechanisms. Firstly, it promotes analytical thinking by requiring students to classify, evaluate, and synthesize information. Secondly, it supports reflective learning, as students continuously revise and improve their conceptual understanding. Thirdly, it enhances collaborative learning by allowing students to discuss and compare different interpretations of interdisciplinary problems.

Within STEAM classes, Concept Mapping can be effectively applied during project development, research activities, and problem-based learning processes. For



“ZAMONAVIY TA’LIM VA TILSHUNOSLIK RIVOJI”
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VOLUME-1, ISSUE-6, 2026

example, when solving engineering or scientific problems, students can create conceptual models that integrate mathematical calculations, technological solutions, scientific principles, and creative approaches. This process enables learners to move beyond isolated subject knowledge and develop a holistic understanding of real-world phenomena.

Therefore, the integration of the Concept Mapping method into STEAM education creates favorable conditions for developing students’ integrative interdisciplinary critical thinking skills. It transforms the learning process from passive knowledge acquisition into an active process of exploration, analysis, and knowledge construction.

CONCLUSION

The development of students’ integrative interdisciplinary critical thinking skills is one of the important objectives of modern STEAM education. The analysis shows that the Concept Mapping method provides effective opportunities for achieving this goal by promoting the organization of knowledge, interdisciplinary connections, analytical thinking, and reflective learning.

The use of Concept Mapping in specialized schools helps students understand the relationships between different fields of knowledge, analyze complex problems, and develop evidence-based solutions. Through visualizing concepts and their connections, students become more active participants in the learning process and develop the ability to independently construct and apply knowledge.

The integration of Concept Mapping into STEAM classes contributes not only to improving academic understanding but also to the formation of higher-order thinking skills, including critical analysis, creativity, problem-solving, and decision-making. Therefore, Concept Mapping can be considered an effective pedagogical tool for enhancing interdisciplinary learning and developing students’ cognitive abilities within specialized educational institutions.



In conclusion, the systematic application of the Concept Mapping method in STEAM education creates favorable conditions for preparing students who are capable of interdisciplinary thinking, innovation, and independent problem-solving in accordance with the requirements of contemporary education.

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