JOURNAL OF MULTIDISCIPLINARY SCIENCES AND INNOVATIONS
VOLUME 5, ISSUE 06
MONTHLY JOURNALS
ISSN NUMBER: 2751-4390
IMPACT FACTOR: 9,08

DEVELOPING CREATIVE PROBLEM-SOLVING SKILLS IN PRIMARY SCHOOL STUDENTS THROUGH STEAM EDUCATION

Karamirzaeva Sevarahon
University of Economics and Pedagogy
Primary Education (Part-Time Program)
Group 50-"F", 4th-Year Student
Tel: +998 33 644 23 20
Email: sevarahonkaramirzaeva@gmail.com

Yusupova Diloromxon Sabirdjanovna
University of Economics and Pedagogy
Acting associates professor of the department of preschool education

Annotation: This article highlights the importance of teaching students using effective and engaging methods in the learning process. It consists of finding creative solutions to achieve high quality in the educational process through interactive methods, integrating subjects and applying them in the educational process. The article provides a broad and detailed overview of the STEAM education model, a pedagogical approach that combines elements of science, technology, engineering, art and mathematics.

Keywords: STEAM education, creative thinking, problem-solving skills, primary education, interdisciplinary integration, project-based learning.

Introduction

In the modern educational process, it is highly important to use high-quality and engaging teaching methods to provide effective education and upbringing for students. Today, it is not sufficient for students to simply acquire knowledge. It is equally essential to develop their ability to independently identify problems and find creative solutions. For primary school students, the formation of these skills plays a crucial role in preparing them for future educational stages.

The STEAM educational model — a pedagogical approach that integrates science, technology, engineering, art, and mathematics — provides students with opportunities to develop creative thinking during the problem-solving process. For example, students can solve mathematical problems through project-based activities in mathematics lessons, design small robots to address engineering challenges in technology classes, or integrate art and science to develop environmental projects that strengthen their creative problem-solving skills.

Based on this, the present study aims to scientifically investigate the development of creative problem-solving skills in primary school students through the application of STEAM methodologies.

Literature Review

The topic of this article is based on interdisciplinary integration, which significantly contributes to the harmonious development of students' creative and analytical thinking. The STEAM concept was systematically elaborated by Georgette Yakman, who emphasized that STEAM should not simply link subjects together but integrate them in a structured and interconnected pyramid model.

John Dewey's principle of "learning by doing" serves as the methodological foundation of STEAM education. J. P. Guilford developed the theory of divergent thinking, while E. P. Torrance created methodologies for assessing creativity. Margaret Honey also made significant contributions to STEAM education, particularly through project-based and technological integration approaches. She emphasized collaboration, independent thinking, decision-making, and step-by-step problem-solving in STEAM environments.

One of the contemporary researchers analyzing STEAM as an instrument for developing 21st-century knowledge and skills is Bryan E. Penprase. He highlights the importance of fostering creative thinking, innovative problem-solving, and critical analysis to develop students' abilities.

Currently, based on these theoretical foundations, STEAM education is widely implemented worldwide to assess and enhance creative thinking levels among young school students, demonstrating positive practical outcomes.

This article considers the development of creative problem-solving skills in primary school students based on STEAM education as both a scientifically and practically significant direction.

Research Methodology

This study employed a mixed-methods approach, integrating both quantitative and qualitative research methods. Such an approach allowed for evaluating changes in students' creative problem-solving skills from statistical as well as analytical perspectives.

Participants

The research was conducted among students of Secondary School No. 2, specifically in classes 3-"L" and 3-"A." A total of 60 students participated in the study. Participants were randomly divided into two equal groups:

- **Experimental group (30 students):** Instruction was organized based on STEAM education with integrated interdisciplinary lessons and project-based activities.
- **Control group (30 students):** Instruction continued using traditional teaching methods (explanation and practice).

In the experimental group, subjects were integrated and STEAM projects were implemented. In the control group, traditional instructional approaches were maintained.

The test tasks included both open-ended and closed-ended questions. Assessment was conducted using a pre-developed rubric based on four performance levels. Content validity was ensured through expert evaluation. Reliability was measured using Cronbach's alpha, with a result of $\alpha = 0.88$, indicating high reliability.

Results

According to pre-test results, the experimental group achieved an average score of 52.4%, while the control group scored 51.8%. No statistically significant difference was found between the two groups ($p > 0.05$).

After eight weeks of experimental implementation, post-test results showed significant improvement. The experimental group's performance increased from 52.4% to 78.7% (growth rate +26.3%). In contrast, the control group's score increased by only 6.5%.

Statistical analysis revealed that the improvement in the experimental group was significant ($p < 0.05$), whereas the changes in the control group were not statistically significant ($p > 0.05$).

Specifically, in the experimental group:

1. The ability to propose alternative solutions increased by 31%.
2. The level of detailed problem analysis improved by 24%.
3. The collaboration index within groups increased by 28%.

These results indicate that the integrative STEAM-based approach has high practical effectiveness in enhancing creative problem-solving skills.

Discussion

Based on the results, it can be concluded that STEAM-based instruction significantly contributes to the formation of creative problem-solving competencies in primary school students. The experimental group demonstrated considerable improvements in generating alternative solutions, multi-directional thinking, self-regulated thinking, and decision-making skills. In contrast, the control group showed statistically insignificant growth.

These findings confirm that interdisciplinary integration and project-based learning serve as effective tools for activating students' thinking processes.

However, limitations of the study include the relatively small sample size and short duration of the experiment. Future research should involve larger samples and longer implementation periods.

Conclusion

This study theoretically and empirically substantiates that applying an integrative STEAM-based approach in primary education significantly influences the development of students' creative problem-solving skills.

The findings provide both theoretical and practical significance for improving primary education methodology and implementing advanced pedagogical technologies in educational practice.

References

1. Torrance, E. P. (1974). Torrance Tests of Creative Thinking. Lexington, MA.
2. Ministry of Public Education of the Republic of Uzbekistan. (2021). State Educational Standards for Primary Education. Tashkent.
3. National Research Council. (2012). A Framework for K–12 Science Education. Washington, DC: National Academies Press.
4. Beers, S. (2011). 21st Century Skills: Preparing Students for Their Future. STEM Symposium.
5. Quigley, C., & Herro, D. (2016). "Finding the Joy in the Unknown": Implementation of STEAM Teaching Practices. Journal of STEM Education, 17(1), 31–37.
6. Yakman, G. (2008). STEAM Education: An Overview of Creating a Model of Integrative Education. Pupils Attitudes Towards Technology Conference Proceedings.
7. Land, M. H. (2013). Full STEAM Ahead: The Benefits of Integrating the Arts Into STEM. Procedia Computer Science, 20, 547–552.
8. Henriksen, D. (2014). Full STEAM Ahead: Creativity in Excellent STEM Teaching Practices. The STEAM Journal, 1(2).