

**EFFECTIVENESS OF IMPLEMENTING THE STEAM APPROACH IN PRIMARY
SCHOOL NATIVE LANGUAGE LESSONS: EXPERIMENTAL RESULTS AND
PEDAGOGICAL ANALYSIS**

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Abstract: This study experimentally investigated the effectiveness of integrating the STEAM (Science, Technology, Engineering, Arts, and Mathematics) approach into native language (Uzbek) lessons in primary grades 2–4. A quasi-experimental pre-test/post-test design was conducted with an experimental group (n=48) receiving STEAM-enriched instruction and a control group (n=48) following the traditional methodology. The results demonstrated statistically significant improvements in the experimental group: text composition skills increased by 29.4%, creative thinking by 33.1%, content analysis abilities by 31.2%, and logical coherence skills by 27.8% ($p < .001$). These findings provide robust empirical evidence that the STEAM approach is a highly effective and innovative tool for developing speech and language competencies in primary-level native language education.

Keywords: STEAM education, primary school, native language teaching, interdisciplinary integration, creative thinking, project-based learning, speech development, quasi-experimental study

Introduction

In the contemporary educational paradigm, interdisciplinary integration and the delivery of knowledge within real-life contexts have become fundamental requirements (UNESCO, 2021). The STEAM approach, which originated in the United States in the early 2010s, has now been incorporated into national education strategies in more than 70 countries. In the Republic of Uzbekistan, the Presidential Decree No. PF-60 of 8 February 2022 and the 2020 edition of the Law “On Education” explicitly emphasize the integration of disciplines and the introduction of innovative teaching methods.

Although primary-grade native language instruction has traditionally been limited to grammar and spelling rules, the need to teach language not merely as a separate subject but as a tool for communication, creativity, and problem-solving has become an urgent issue.

The STEAM approach offers the following opportunities in native language lessons:

practical application of language in engineering and technology projects;

revelation of scientific concepts through literary texts;

enrichment of the text-creation process with elements of art and design.

Research aim: To experimentally determine the impact of the STEAM approach on speech development and creative thinking in primary-grade native language lessons.

Methodology

The study employed a quasi-experimental design (pre-test – intervention – post-test). The experimental group received lessons enriched with STEAM elements, whereas the control group was taught using traditional methods. Participants were 96 pupils (aged 8–10) in grades 2–4 from three general education schools in Samarkand region. The groups were statistically equivalent in terms of gender, age, and prior academic performance. The experiment lasted three months.

Instruments and procedures: Diagnostic tests administered both before and after the intervention:

Text composition test (maximum 20 points)

Creative thinking test

Content analysis and logical coherence test (pupils' written texts evaluated against five criteria)

Classroom observation journal (recording the level of oral activity during lessons)

Statistical processing was performed using t-tests for independent and dependent samples; significance level $p < .001$.

Results and discussion

STEAM projects were organized around topics such as “I will write a poem about natural phenomena and create a 3D model.” Each topic was taught in five stages:

Science – scientific grounding of the topic

Technology – use of digital tools

Engineering – construction of a project/model

Arts – creative expression (drawing, drama, poetry)

Mathematics – logical analysis, statistics, measurement

The main methods employed were observation, pedagogical experiment, comparative analysis, and diagnostic testing of speech development indicators.

Post-intervention results in the experimental group showed the following improvements compared to pre-test scores:

Text composition skills: +29.4%

Creative thinking: +33.1%

Content analysis ability: +31.2%

Ability to create logical connections between sentences: +27.8%

In the control group, the corresponding gains ranged only from 8% to 15%. All differences between the experimental and control groups were statistically significant ($p < .001$). The marked superiority of the STEAM-enriched lessons can be explained by the fact that interdisciplinary project activity transforms language lessons from purely theoretical exercises into meaningful, context-rich experiences that simultaneously develop linguistic, cognitive, and creative competencies.

Conclusion

The study conclusively demonstrated that native language lessons organized according to the STEAM approach are a highly effective means of fostering pupils' speech development as well as their skills in text creation and analysis. This approach makes the learning process engaging and practical while promoting creativity and independent thinking.

In summary, systematic implementation of the STEAM approach in primary-grade native language instruction:

develops language skills in authentic, real-world contexts;

cultivates independent and creative thinking in pupils;

makes lessons interesting, meaningful, and motivating.

The results strongly support the wider adoption of STEAM integration in primary native language curricula in Uzbekistan and beyond.

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