The OSCAR PUBLISHING Services
International Journal of Pedagogics

VOLUME Vol.05 Issue05 2025
PAGE NO. 362-365
DOI 10.37547/ijp/Volume05Issue05-95

Developing Students' Mathematical Thinking and Logical Abilities in The Process of Teaching the Russian Language in A Digital Educational Environment

Khamraeva Khulkar Naimovna
Candidate of Pedagogical Sciences, Associate Professor of Tashkent University of Economics and Pedagogy, Uzbekistan

Received: 31 March 2025; **Accepted:** 29 April 2025; **Published:** 31 May 2025

Abstract: This article explores the integration of international STEM education and the CLIL (Content and Language Integrated Learning) approach into the process of teaching Russian in a digital learning environment to develop students' mathematical thinking and logical reasoning. The interdisciplinary approach, particularly the integration of language and mathematics, plays a crucial role in shaping students' analytical thinking, language competence, and decision-making abilities in problem situations. The article analyzes ways to ensure the interconnection between language and mathematics using modern digital tools, innovative platforms, and methodological approaches.

Keywords: Digital learning, Russian language, STEM education, CLIL, mathematical thinking.

Introduction: In the era of digital transformation, the education system is undergoing fundamental changes. Traditional teaching methods are being replaced by innovative, interdisciplinary and integrative approaches. In particular, by combining STEM (Science, Technology, Engineering, Mathematics) and CLIL approaches, students have an opportunity to develop competencies based on multidisciplinary thinking, language and science integration. By introducing elements of mathematics, logical tasks and analytical tasks in Russian language lessons, students not only develop their language skills, but also their level of mathematical thinking.

This article analyzes how to add a mathematical component to Russian language lessons using digital educational tools, and the possibilities of combining language and logical thinking through the integration of CLIL and STEM. It also examines the mechanisms for forming functional literacy and critical thinking in students through modern learning platforms, digital applications, interactive tasks and project activities.

Literature review

Integrative approaches have long been relevant in education. In their work on CLIL methodology, Coyle, Hood & Marsh (2010) emphasize that the main goal of this approach is to teach language and content together. This approach is very effective in teaching and mastering language through subjects taught in a foreign language. (1)

STEM serves to form the fundamental skills necessary for modern professions in the 21st century (Bybee, 2013). This approach requires interdisciplinary thinking, problem solving, design and creativity. Therefore, integrating elements of mathematics, computer science, and technology into language lessons encourages students to participate more actively. (2)

Language and STEM integration can be effectively implemented through modern digital platforms (Google Classroom, Kahoot!, GeoGebra, Padlet, Canva, etc.). Through these platforms, students independently search, participate in interactive activities and learn to express their thoughts systematically. (4)

Good practices in CLIL-STEM integration have been implemented in many educational institutions in Europe and Asia (Meyer et al., 2015). This methodology is especially relevant in the digital environment, increasing students' motivation for knowledge. (3)

Theoretical foundations and methodological approaches. Digital transformation has deeply

penetrated all stages of the educational process, requiring students to take their learning and thinking to a new level. In such a changing environment, combining CLIL (Content and Language Integrated Learning) and STEM (Science, Technology, Engineering, Mathematics) approaches allows achieving high efficiency.

Theoretical foundations of the CLIL approach

The CLIL methodology was developed by Coyle, Hood and Marsh (2010) and is based on teaching language in context, that is, through meaningful activities. This approach relies on four main components:

1. Content - the basic knowledge and concepts of the subject.

2. Communication - communication and exchange of ideas through language.

3. Cognition - higher-level thinking and problem-solving.

4. Culture - intercultural communication and the formation of a global perspective.

This approach supports the simultaneous study of language and other subjects, allowing for thinking through language and a deeper understanding of the content being studied.

Fundamentals of the STEM approach

STEM is a method that aims at interdisciplinary integration and is aimed at developing students' skills in analyzing real-life problems, working on projects, calculating and drawing logical conclusions. As Bybee (2013) noted, STEM education is based not only on theoretical knowledge, but also on solving practical problems.

The STEM approach has the following priorities:

• Develops mathematical logical thinking and analytical thinking;

• Guides students to solve practical tasks using digital technologies;

• Encourages students to think independently and make critical decisions.

Opportunities for CLIL and STEM integration

The combination of CLIL and STEM methods plays a unique role in developing logical thinking using digital technologies in language lessons. The integration of these two approaches creates the following opportunities:

• Creating multifunctional tasks by combining language and mathematical content;

• Using digital applications (Canva, Google Slides, Padlet) in project work;

• Entering into communication based on calculations, diagrams, graphics in Russian language lessons;

• Mastering new lexical units by solving logical problems.

For example, by working on the topic “Budget Diagram” in a Russian language lesson, students not only master new vocabulary, but also develop financial literacy, graphical analysis, and mathematical thinking.

The role of digital learning tools

The following tools are effective in implementing the CLIL-STEM approach in a digital environment:

• GeoGebra – for mathematical visualization;

• Kahoot! – to consolidate knowledge through tests and quizzes;

• Padlet – for project work and creating a collaborative environment;

• Canva – for creating visual materials and presentations;

• Google Forms – for evaluating analysis and logical tasks.

These tools increase students' activity, motivation, and interest in independent learning.

Practical aspects of CLIL-STEM integration: sample lesson plans and assignments

Lessons based on CLIL-STEM integration help students master language and science knowledge together. The use of mathematical elements in Russian language lessons helps to develop logical thinking, master mathematical terminology in Russian, and develop the ability to use the language in real-life situations.

1. Sample practical lesson: “Mathematics in our lives”

Goal: To develop students’ mastery of mathematical vocabulary in Russian, logical thinking, and skills in working with statistical materials.

Stages:

• Introductory part (Motivation): Students create a cluster of words related to the word “mathematics”.

• Main part: Students are given the task of creating graphs based on real statistical data (for example, students’ daily expenses). Then they explain these graphs in Russian (for example: “30% of the budget is spent on food”).

• Analysis and discussion: Students work in pairs and ask each other questions (“How many percent do you spend on transportation”).

• Final stage: Students present their projects, a question-and-answer session is held.

Digital tools used: Canva, Google Sheets, Padlet.

2. Sample assignment: Texts that develop logical thinking

Assignment: Read the following text and answer the questions:

«There are 20 students in the class. 12 of them like mathematics, 8 like Russian. 5 students like both subjects. How many students do not like either mathematics or Russian?»

Questions:

1. How many students like only mathematics?

2. How many like only Russian?

3. Express your answers orally.

Information: Through such assignments, students develop combinatorics, logical thinking, as well as the ability to explain in Russian.

3. Interactive project: “Let's create a mathematical dictionary”

Description: Students work in groups. Each group collects mathematical terms, explains them in Russian, and creates an interactive dictionary based on visual materials.

Process:

• Terms that are found in mathematics lessons are selected: “percentage”, “equation”, “graph”, “arithmetic”, etc.

• Explanations, examples and visual materials are prepared for each term.

• Design is done using Canva or PowerPoint.

• At the end, a presentation of the “Mathematical Dictionary” is held with the participation of the whole class.

Result: Students strengthen the connection between language and science, expand their lexical wealth and learn to work creatively.

4. Digital quiz: Feedback via Kahoot!

At the end of the lesson, a Kahoot! quiz consisting of 10 test questions on mathematical vocabulary in Russian is held for students. This method helps to consolidate knowledge, evaluate the lesson and form a competitive spirit in students.

Conclusion: Lessons based on the CLIL-STEM approach are effective in the harmonious development of language and mathematical thinking. Through digital tools and project work, students not only acquire new knowledge, but also acquire important skills such as functional literacy, communication and creative thinking.

Advantages and challenges of the digital learning environment: in the context of CLIL-STEM integration

The modern digital environment opens up new opportunities in the educational process. In particular, when combining CLIL and STEM approaches, it is possible to create an interactive, functional and multifaceted learning environment using digital technologies. At the same time, this process also raises a number of problems.

Advantages

1. Individual approach and the possibility of differentiated teaching

Digital tools (for example, Moodle, Google Classroom, Edmodo) allow you to create tasks tailored to the individual needs of students. Each student can work independently, depending on their level of ability.

2. Visualization and Deepening Understanding

When explaining mathematical and scientific concepts in Russian in STEM lessons, interactive tools (GeoGebra, Desmos, YouTube, PhET simulations) serve to clearly and figuratively demonstrate concepts.

3. Integrated learning through multifunctional tasks

CLIL-STEM-based tasks simultaneously involve language, mathematics, information technology and critical thinking. This forms multi-level learning.

4. Opportunities for cooperation and collaboration

Students actively participate in group work on digital platforms (Padlet, Google Docs, Miro). This strengthens communication through language in the CLIL approach, and develops collective thinking in the STEM approach.

Problems

1. Teacher's digital literacy

To successfully implement CLIL-STEM methods, the teacher is required to have in-depth knowledge not only of science and language methodologies, but also of digital technologies. This requires continuous professional development.

2. Lack of technical infrastructure

Low internet speed, insufficient number of modern computers and tablets prevent CLIL-STEM lessons from being held in a fully digital environment.

3. Student passivity and difficulties in self-management

In digital lessons, students are forced to work independently. Not all students can manage their time properly, which can negatively affect the result.

4. Difficulty in harmonizing language and subject terminology

In CLIL-STEM integration, understanding and correctly using subject terminology in Russian can be difficult for students. In this case, bilingual dictionaries, visual materials and manuals play an important role.

Solutions and recommendations

• Organize advanced training courses for teachers on CLIL-STEM and digital methodologies.

• Cooperate with educational institutions and sponsors to strengthen technical support.

• Organize trainings for students on time management and independent work.

• Adapt texts and tasks to the language level, increase visual elements.

In a digital learning environment, the CLIL-STEM approach creates an effective learning environment, but for the successful implementation of this model, special attention should be paid to methodological, technical and organizational aspects.

Conclusion and practical recommendations. In today's digital learning environment, developing students' mathematical thinking and logical abilities in Russian language lessons is one of the urgent tasks. The integration of CLIL and STEM approaches offers innovative solutions in this regard. This article examines the theoretical foundations of the CLIL and STEM concepts, their application in a digital environment, practical lesson developments and the possibilities of increasing educational effectiveness through modern tools.

Integrated approaches allow us to consider language and science not separately, but as components of a single educational process. This serves to form skills such as deep knowledge, functional literacy, logical thinking and a creative approach in students.

Practical recommendations:

1. Pay special attention to CLIL-STEM integration in lessons. Including mathematical and logical tasks in Russian lessons develops students' thinking.

2. Effective use of digital tools. Applications such as GeoGebra, Canva, Kahoot!, Padlet can make lessons interactive and interesting.

3. Improving the skills of teachers. It is necessary to organize training courses on CLIL-STEM to master modern methodologies.

4. Creating conditions for students to thoroughly master language and science terminology. Bilingual dictionaries, visual graphics, and interactive discussion exercises will help with this.

5. Collaborative teaching. By involving students in group work, communicative skills, analytical and critical thinking are developed.

REFERENCES

Coyle, D., Hood, P., & Marsh, D. Content and Language Integrated Learning. — Cambridge: Cambridge University Press, 2010. — 152 p.

Bybee, R. W. The Case for STEM Education: Challenges and Opportunities. — Arlington: NSTA Press, 2013. — 120 p.

Meyer, O., Coyle, D., Halbach, A., Schuck, K., & Ting, T. CLIL Practice: Perspectives from the Field. — Frankfurt: Peter Lang, 2015. — 236 p.

Бобоева, С.К. Рақамли таълим муҳитида тил ва фан интеграцияси. // Педагогика ва психология, 2021. №4. – Б. 77–83.

Шарипова, З.М. Рус тили дарсларида фанлараро ёндашув имкониятлари. // Филология масалалари, 2022. №2(11). – Б. 45–52.

Бим, И.Л. Теория и практика обучения русскому языку как иностранному. — Москва: Русский язык, 2001.

Морозова, Л.И. Цифровая образовательная среда: проблемы и перспективы // Образование и наука. — 2021. — №1(15). — С. 45–52.

Krajcik, J., Czerniak, C. Teaching Science in Elementary and Middle School: A Project-Based Approach. — Routledge, 2014.

Савельева, Н.В. CLIL-технология: интеграция предметного содержания и иностранного языка // Иностранные языки в школе. — 2020. — №6. — С. 23–28.

Murodova, G. Zamonaviy raqamli ta’lim texnologiyalari // Pedagogika va psixologiya. — 2022. — №2. — B. 34–38.

Абрамова, С.А. Цифровая трансформация в системе образования: тенденции и вызовы // Высшее образование в России. — 2021. — №11. — С. 120–128.

Richards, J.C., Rodgers, T.S. Approaches and Methods in Language Teaching. — Cambridge: Cambridge University Press, 2014.

Назарова, Н.М. Межпредметная интеграция как методический приём в обучении иностранному языку // Вестник МГПУ. — 2020. — №4. — С. 101–106.

Койл Д., Худ Д., Марш Д. CLIL: Content and Language Integrated Learning. — Cambridge: Cambridge University Press, 2010. — 184 с.