



METHODOLOGY FOR USING DIGITAL TECHNOLOGIES AND INTERACTIVE GAMES IN PRIMARY SCHOOL MATHEMATICS LESSONS

Kholiqova Surayyo Shuhratjon qizi

Student of group 620-24 BTrus (3rd year, Primary Education specialization), Department of Humanities,

Faculty of General Education, Tashkent Perfect University.

<https://doi.org/10.5281/zenodo.23204838>

Annotatsiya: Mazkur maqolada boshlang'ich sinf matematika darslarida raqamli texnologiyalardan foydalanishning ilmiy-nazariy asoslari hamda amaliy imkoniyat-lari tadqiq etilgan. Maqolada raqamli ta'lim vositalarining matematika fanini o'qitish jarayonidagi didaktik ahamiyati, ularning o'quvchilarning matematik savodxonligi, mantiqiy tafakkuri va bilish faolligini rivojlantirishga ta'siri tahlil qilingan. Boshlan-g'ich sinf o'quvchilarining yosh va psixologik xususiyatlarini inobatga olgan holda, matematika darslarida raqamli texnologiyalar asosida o'qitishning samarali shakl, metod va vositalari ishlab chiqilgan. Ularning natijalari asosida raqamli texnologiya-lardan foydalanish o'quv jarayonining samaradorligini oshirishga xizmat qilishi ilmiy jihatdan asoslab berilgan

Kalit so'zlar: boshlang'ich ta'lim, matematika ta'limi, raqamli texnologiyalar, raqamli ta'lim vositalari, axborot-kommunikatsiya texnologiyalari, interaktiv ta'lim, matematik savodxonlik, raqamli pedagogika, ta'lim samaradorligi, GeoGebra, Wordwall, Flippity, Learningapps.

Abstract: This article examines the scientific-theoretical foundations and practical applications of computer technologies in school mathematics lessons. It analyzes the didactic value of using computers in instruction and their impact on enhancing students' mathematical literacy, logical thinking, and cognitive engagement. Effective tools and methods for teaching mathematics to primary school students using computers—tailored to their age-specific needs—have been developed. The article presents research findings regarding the educational outcomes achieved through these approaches.

Keywords: computational education, mathematics education, technology, computer-based education, information and communication technologies (ICT), interactive learning, mathematical literacy, computer pedagogy, learning, GeoGebra, Wordwall, Flippity, LearningApps.

Аннотация: В статье рассматриваются научно-теоретические основы и практическое применение компьютерных технологий на уроках математики в школе. Анализируется дидактическая ценность использования компьютеров в процессе обучения, а также их влияние на повышение математической грамотности, развитие логического мышления и познавательной активности учащихся. Разработаны эффективные инструменты и методы обучения математике младших школьников с использованием компьютерных технологий, адаптированные к их возрастным особенностям. Представлены результаты исследований, касающиеся образовательных достижений, полученных благодаря применению данных подходов.

Ключевые слова: компьютерное обучение, математическое образование, технологии, обучение с использованием компьютеров, информационно-коммуникационные технологии (ИКТ), интерактивное обучение, математическая грамотность, компьютерная педагогика, учебный процесс, GeoGebra, Wordwall, Flippity, LearningApps.

The use of digital technologies and interactive games in primary school mathematics lessons plays a vital role in fostering students' interest in the subject and in mathematical thinking, ensuring a deep understanding of the material, and developing logical reasoning skills.

Today, the digitalization of education systems is progressing rapidly on a global scale. Digital technologies are recognized as key factors in fundamentally transforming the content, forms, and methods of education, boosting students' enthusiasm for learning, and cultivating skills such as independent thinking and creative approaches. The effective use of digital technologies is particularly significant at the primary education stage for establishing foundational knowledge and competencies. Mathematics is a core subject in primary education for developing students' intellectual capabilities, including logical reasoning, analysis, comparison, and generalization. Given that the subject involves complex concepts, practical calculations, and abstract thinking, there is a growing need to integrate modern digital technologies alongside traditional teaching methods. Interactive presentations, multimedia resources, virtual models, electronic textbooks, mobile applications, and digital learning platforms serve to enhance the effectiveness of mathematics lessons. Modernizing the education system, creating a digital learning environment, and developing the digital competencies of teaching staff have been designated as priority areas of state policy in the Republic of Uzbekistan. Although some scientific research has been conducted on the use of digital technologies in primary education, there is a need for a systematic study regarding the specific opportunities for using digital technologies in mathematics lessons, as well as their didactic, methodological, and pedagogical effectiveness. In this context, the scientific analysis of the potential for using digital technologies in primary mathematics lessons, the determination of their impact on students' mathematical literacy and cognitive activity, and the development of effective usage methodologies underscore the relevance of this research.

1. The Role of Digital Technologies and Interactive Games

Primary school-aged students (7–10 years old) primarily possess visual-sensory and imagery-based thinking. Explaining concepts through actions, colorful animations, and game elements yields more effective results than having them memorize dry rules and formulas.

- Active participation and motivation: Games transform the lesson from a tedious activity into an engaging adventure.
- Visualization: It provides a clear demonstration of abstract concepts (such as fractions, geometric shapes, and mathematical operations).
- Individual approach: Each student has the opportunity to work at their own pace.
- Immediate feedback: Digital programs instantly identify errors and assist in correcting them.

2. Key Digital Tools and Programs Used

Modern platforms and tools recommended for use in primary mathematics lessons:

Interactive whiteboards and projectors—such as Smart Board, BenQ, and Epson—are powerful visual and practical tools that fundamentally transform the teaching process in

primary mathematics classes. Each offers unique capabilities for enhancing lesson effectiveness. Methodologies and practical examples regarding the use of these devices in mathematics lessons are presented below.

1. Smart Board (Interfaol Panel / Taxta)

Smart Board — bu o'quvchilar va o'qituvchi bevosita qo'l yoki maxsus qalam (stylus) yordamida ekranga tegib boshqarishi mumkin bo'lgan katta planshetga o'xshash raqamli taxta.

- Mathematical capabilities:

Geometric drawings: Drawing perfect shapes and angles—and measuring them—without using a ruler, compass, or protractor.

Moving objects: For example, when solving problems, demonstrating the process of "adding 3 apples to 5 apples" by physically sliding the apple images. Handwriting-to-text conversion:

Automatically converting numbers and equations handwritten by the teacher on the board into a standard font.

- Practical example ("Problems with concise conditions"): A student comes to the board, uses their finger to slide the numbers from the problem statement into the correct positions, and finds the unknown value.

2. BenQ Interactive Panels

BenQ screens stand out due to their eye-protection technologies (Eye-Care) and built-in educational software (CoSpace, EZWrite).

- Mathematical capabilities:

Cloud integration: Teachers can open math assignments, slides, and games prepared for the lesson directly on the screen from Google Drive or OneDrive. Multi-touch mode: Multiple students can go to the board simultaneously to solve problems in column format or compete against each other (e.g., to see who can perform addition the fastest).

Recording and playback: The ability to record the lesson process and replay it later for students who did not fully grasp the material.

- Practical example ("Chain"): Students take turns filling in a number chain displayed on the screen using the BenQ pen.

3. Epson Interactive Projectors

Epson projectors transform any flat surface (such as a whiteboard or wall) into an interactive board. Their key advantage is that, thanks to ultra-short-throw projection, the teacher's shadow does not fall on the screen.

- Applications in mathematics:

Large screen format: Provides a large, clear visual display that all children can see, even in small classrooms.

Working with styluses: Two people can work on different problems simultaneously using two special markers.

Displaying real objects (via document camera): For example, a small image from a textbook or actual counting sticks can be placed under the projector and displayed on the screen in a large format for the entire class to see.

- Practical example ("Operations with counting sticks"): The teacher arranges counting sticks on the table, while the Epson projector overlays digital animations or annotations onto the display. Methodological Recommendations for Classroom Use

1. Time Limits: According to hygiene standards for primary grades, continuous work in front of interactive screens should not exceed 10–15 minutes. The remaining time should be spent working with traditional notebooks and textbooks.

2. Active Participation: To ensure students are not merely passive observers, it is important to have 2–3 students come to the board during each lesson to interact directly with the digital tools.

3. Game Elements: Conducting tasks from platforms like Wordwall or LearningApps as a whole-class activity—using the interactive panels and projectors—makes the lesson more engaging.

Wordwall, LearningApps, Kahoot, and Quizizz are among the most popular and user-friendly digital tools for organizing engaging, competitive, and effective primary school mathematics lessons. Each offers unique didactic capabilities and specific methodologies for application in math lessons:

1. Wordwall

Wordwall is a highly popular platform among teachers that allows for the creation of interactive games based on various templates.

• Capabilities for mathematics lessons:

A single game template can be converted into a different game type (e.g., "Open the Box," "Showdown," "Spin the Wheel") with the click of a button.

The game elements are visually vibrant and easily understood by primary school students.

• Practical examples and templates:

"Match up": For instance, math problems (e.g., 5×4) are displayed on the left, and answers (e.g., \$20\$) on the right; students connect them with a line.

"Wheel of Fortune": Students spin the wheel and answer a multiplication table question based on the number that appears.

"Maze Chase": Similar to the game Pac-Man, students solve problems by navigating a maze to find and enter the door displaying the correct answer.

2. LearningApps

LearningApps is a free platform designed primarily for creating short exercises and interactive tasks; it offers a wide range of ready-made resources in the Uzbek language.

• Applications in mathematics lessons:

Highly suitable for exercises that develop logical thinking, such as classifying, grouping, and arranging items in chronological order.

Teachers can create their own exercises tailored to the lesson content or use ready-made resources created by others.

• Practical examples and templates:

"Grouping": For instance, sorting even numbers into one box and odd numbers into another.

"Crossword" and "Word Search": Solving crosswords to reinforce mathematical terms (e.g., perimeter, area, addend, divisor).

"Find the Match" (Memory): Form a pair by revealing a card containing a problem and the card hiding its corresponding answer.

3. Kahoot!

Kahoot is a gamified quiz platform that fosters a healthy competitive atmosphere in the classroom, where students participate using their smartphones or the classroom's interactive whiteboard.

- Applications in math lessons:

An excellent tool for reinforcing a new topic at the end of a lesson or for conducting a quick assessment on previously covered material.

Students quickly respond to questions displayed on the screen by using the colored shapes and buttons on their own devices. Those who provide fast and correct answers move up the leaderboard.

- Scenario for use in mathematics:

"Speed Math": A problem like $\$12 + 15\$$ appears on the screen, and students are given 20 seconds to select the correct answer. At the end of the lesson, the three students with the highest scores are recognized.

4. Quizizz

Quizizz is a quiz platform similar to Kahoot, but its main advantage is that students can answer questions at their own pace (the time pressure is less intense than in Kahoot).

- Features for mathematics lessons:

After each correct answer, funny memes, cartoon characters, or encouraging animations appear on the screen.

It can also be assigned as homework (students play the game at home and send their results to the teacher).

- Scenario for mathematical application:

"Problem-Solving Marathon": Students read word problems, solve them at their own pace, and select the correct answers. Meanwhile, the teacher monitors in real-time which problem each student is currently working on.

How Should It Be Integrated into the Lesson?

Using these tools step-by-step in primary school lessons yields the best results:

1. Explaining/practicing a new topic: Playing games together on an interactive whiteboard using LearningApps or Wordwall.

2. Consolidating the lesson and assessing performance: Organizing a quick competition via Kahoot.

3. Independent work or homework: Assigning engaging quiz tasks via Quizizz.

In addition to the platforms mentioned above, it is recommended to use several other specialized digital tools and interactive gaming environments to further enrich primary school mathematics lessons and boost student engagement.

Additional platforms widely used in primary mathematics teaching methodology and their capabilities include:

5. Matific

Matific is one of the world's most popular gamified educational platforms specializing in primary school mathematics.

- Capabilities in mathematics lessons:

Students learn addition, subtraction, multiplication, division, and geometric concepts through digital games ("adventures").

It features an artificial intelligence system that adapts to each student's level of knowledge.

- Practical application: The teacher can select an assignment relevant to the lesson topic and assign it to students to complete—either individually or in groups—using tablets.

6. Khan Academy Kids

Khan Academy Kids is a free, ad-free educational app featuring cartoon characters, designed for children aged 2 to 8.

- Applications in mathematics lessons:

It includes colorful, interactive games for primary school students (grades 1–2) that teach counting, number sequences, basic measurements, and logic puzzles.

Teachers can use these to build motivation at the start of a lesson or as visual aids during short breaks.

7. Canva (Interactive Presentations and Games)

Canva is an excellent tool not only for graphic design but also for creating interactive presentations and games.

- Applications in mathematics lessons:

Teachers can create custom math quests or interactive presentations—such as "Who Wants to Be a Millionaire?" or "Math Riddles"—tailored to their specific class.

During the lesson, students select correct answers by clicking buttons within the presentation.

Sample digital lesson plan (45 minutes):

1. Introduction (5 minutes): Introducing the new topic using a vibrant, engaging slide created in Canva.

2. Main Part / Explanation (15 minutes): Completing a group activity using LearningApps on a Smart Board or BenQ interactive whiteboard.
3. Consolidation and competition (15 minutes): Conducting a quick interactive quiz for the whole class using Kahoot or Quizizz.

4. Independent work / Homework (10 minutes): Providing a link to complete game-based tasks on the Wordwall or Matific platforms at home.

3. Methodological Classification of Interactive Games

Games used in mathematics lessons can be categorized as follows:

1. Games enhancing calculation skills: ("Chain," "Who is fastest?", "Trip to the shop"). For example, games on the Wordwall platform involving addition and subtraction, such as "Choose the right door" or "Drop the ball into the basket."

2. Games developing geometric concepts: Assembling geometric shapes, digital versions of Tangram, and virtual laboratories for calculating perimeter and area.

3. Games fostering logical thinking: Mazes, puzzles, and tasks such as "Find the odd one out" or "Continue the pattern."

4. Stages of Implementation During the Lesson (Methodological Recommendations)

Digital technologies can be employed at any stage of the lesson, provided that standards and hygiene requirements (SanPiN regulations) are observed (e.g., screen time in primary grades should not exceed 10–15 minutes):

- When explaining a new topic: Illustrating real-life situations via an interactive whiteboard using animation (e.g., introducing the concept of division by splitting apples).

- During the reinforcement stage: Students engage in mini-games (such as quizzes via Kahoot or LearningApps) on tablets or on the interactive whiteboard under the teacher's guidance.

- For homework and assessment: Completing engaging mathematics tasks via mobile applications with the involvement of parents.

The aim is to provide a scientific-theoretical and practical rationale for the use of digital technologies in primary school mathematics lessons and to develop a methodological system designed to enhance their effectiveness. Based on the research objective, the following tasks were defined: analyzing pedagogical, psychological, and methodological literature regarding the use of digital technologies in primary mathematics education; and identifying the didactic capabilities of existing digital educational tools and platforms used in mathematics lessons.

- to define the pedagogical conditions for using digital technologies, taking into account the age-related and psychophysiological characteristics of primary school students;
- to develop effective forms, methods, and tools for teaching mathematics based on digital technologies;
- to organize experimental trials based on the developed methodological recommendations and analyze their effectiveness.

There is a significant body of research in international scientific literature regarding the use of digital technologies (ICT) and digital tools in primary education. For instance, a systematic literature review on teaching mathematics using ICT was published in 2023, analyzing articles indexed in Scopus and Web of Science (WoS). These studies indicate that, while digital technologies hold potential for enhancing the mathematics learning process, the number of articles in scientific publications remains relatively low, and there is a lack of in-depth research on the subject. International literature reviews highlight the existence of research on the application of digital games (DGBL), interactive tools, mobile applications, dynamic geometry software (such as GeoGebra), and other digital technologies in mathematics education. These studies present findings indicating that digital tools enhance students' motivation and comprehension. Foreign research has also examined the integration of digital technologies into teaching practices, as well as their impact on instructional methodology and lesson effectiveness. Particular attention is paid to interactive educational platforms, multimedia tools, online assessment systems, and adaptive learning systems.

References:

1. O'zbekiston Respublikasining "Ta'lim to'g'risida"gi Qonuni. – Toshkent, 2020.
2. O'zbekiston Respublikasi Prezidentining "Raqqamli O'zbekiston – 2030" strategiyasi to'g'risidagi Farmoni. – Toshkent, 2020.
3. Turg'unov S.T. "Ta'limda axborot-kommunikatsiya texnologiyalari" – Toshkent: Fan va texnologiya, 2021. REPUBLICAN SCIENTIFIC-PRACTICAL CONFERENCE "EDUCATIONAL TRANSFORMATION IN THE DEVELOPMENT OF NEW UZBEKISTAN: PROBLEMS AND SOLUTIONS", FEBRUARY 12, 2026 42
4. Karimova G.A. "Boshlang'ich sinf matematika darslarida AKTdan foydalanish masalalari" Pedagogik mahorat. – 2022.
5. Rasulov A.X. "Raqqamli texnologiyalar asosida ta'lim jarayonini tashkil etish" Ta'lim va innovatsiya. – 2023.
6. Xudoyberdiyev B.B. "Boshlang'ich ta'limda raqqamli vositalarning didaktik imkoniyatlari" Zamonaviy ta'lim. – 2024