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# TEACHING ABA THERAPY, PECS AND EDUCATIONAL GAMES TO CHILDREN WITH AUTISM SPECTRUM DISORDERS

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**Annotation.** This study explores the effectiveness of three instructional methods–Applied Behavior Analysis (ABA) therapy, the Picture Exchange Communication System (PECS), and educational games–in teaching mathematics to students with autism spectrum disorder (ASD). However, there remains a lack of structured methodologies for teaching specialized subjects, such as mathematics, to students with autism. This research employed a comparative case study approach with three seven-year-old autistic students to evaluate the impact of each method on their engagement, understanding, and completion of math tasks. Findings indicated that each approach contributed uniquely to overcoming the students' challenges in mathematics. ABA therapy provided a structured, reinforcement-based learning environment that enhanced task completion; PECS utilized visual communication, aligning with autistic students' strengths as visual learners; and educational games successfully sustained motivation and engagement. The results suggest that incorporating a combination of these methods significantly improves the learning experience and math skills of autistic students. The study recommends that educators adopt these evidence-based practices to foster a more inclusive and effective learning environment for students with ASD. Further research is recommended to examine the long-term impact of these methods across different subject areas and educational settings.

**Keywords:** Autism Spectrum Disorder, Inclusive Education, Applied Behavior Analysis, Picture Exchange Communication System, Educational Games, Mathematics Instruction, mathematical abilities, mathematical concepts.

**Introduction.** In 1994, the Salamanca Statement and Framework for Action on Special Needs Education, issued by UNESCO (United Nations Educational, Scientific, and Cultural Organization) marked a significant turning point in how schools and inclusive education were conceptualized. The statement underscored the notion that mainstream schools adopting inclusive practices represent the most efficient and cost-effective means of educating the majority of children. Furthermore, it highlighted the essential role of inclusive schools in reducing discrimination, fostering welcoming communities, building an inclusive society, and promoting education for all [1].

Over the past 20 years, Kazakhstan has implemented numerous educational reforms and demonstrated a strong commitment to the global movement toward inclusive education. The Constitution of the Republic of Kazakhstan guarantees every child's right to education. Article 30 ensures that all citizens are entitled to free, compulsory secondary education and access to higher education. In addition, several laws address the educational rights of children with disabilities. These include the 2002 "On the Rights of the Child in the Republic of Kazakhstan," the 2005 "On Social Protection of Persons with Disabilities in the Republic of Kazakhstan," and the 2002 "On Social and Health Care and Pedagogical Correctional Support for Children with Limited Capabilities." Together, these laws protect children's rights, ensuring that children with disabilities have access to education [2].

Recent efforts to reform inclusive education, such as the State Program for Educational Development (SPED) 2011–2020, have concentrated on making schools in Kazakhstan more inclusive. A key goal of SPED was to increase the number of inclusive schools to 70% by 2020.

However, this target has not yet been fully achieved [3]. In 2015, the National Academy of Education, named after Y. Altynsarin (NAE), introduced changes to the terminology used for children with special needs. These changes aimed to reduce the stigma associated with disability and further the development of inclusive education. Despite these efforts, significant gaps remain, particularly in providing methodological guidelines for educators on teaching specialized subjects, such as mathematics, to students with psychological diagnoses like autism. Autism Spectrum Disorder (ASD) is a developmental disorder that affects communication, behavior, and social interaction.

Mathematical skills are integral to everyday life. These include counting, telling time, making payments, measuring, weighing, interpreting basic graphics and diagrams, and performing numerical operations. Such skills are also critical for fostering independence. While numeracy forms a key component of mathematics, students with severe and multiple disabilities, including autism, often face substantial challenges in mastering these skills. For example, in a study of 949 clinically referred children, nearly 25% of autistic students were identified as having a specific mathematics learning disability. In contrast, similar studies report that only 3% to 14% of typically developing students experience such disabilities [4]. These mathematical difficulties in autistic students are often attributed to differences in executive functioning, including challenges with planning, organization, working memory, mental flexibility, attention, self-monitoring, and impulse control [5]. Furthermore, language-related differences associated with autism may also hinder abilities in areas such as number-word sequencing, calculation, fact retrieval, and problem-solving.

May and Rinehart identified five contextual factors that might explain why students with disabilities, including autism, underperform in mathematics [5]:

1.insufficient opportunities to learn;

2.an overemphasis on teaching functional mathematical skills, such as purchasing items, rather than broader, more structured mathematical concepts;

3.a lack of teacher preparation or confidence in teaching mathematics to autistic students;

4.difficulties arising from students' challenging behaviors or lack of attention;

5.struggles with collecting data and implementing evidence-based teaching strategies in daily classroom settings.

Research into mathematical abilities in autistic students shows that, beyond overall performance, there are specific areas where these students demonstrate unique strengths and weaknesses. Some autistic individuals excel in rapid numerical calculations, while others perform on par with or below the level of non-autistic peers [6]. Certain studies highlight autistic individuals' strengths in visuospatial tasks. For example, Shah and Frith [7] observed superior performance in embedded figure tests among 20 autistic adolescents and in block design tests among 20 autistic adults aged 15–25. Similarly, Georgiou [8] found that autistic students were quicker at identifying feature and conjunctive targets within a visual array compared to non-autistic peers. Despite these strengths in numerical calculation and visuospatial awareness, some autistic students face difficulties in areas such as word problems and practical math concepts [9].

Processing speed is another area where challenges may arise. For instance, Moradi [10] reported that preschool-aged autistic children exhibited slower processing speeds relative to their verbal abilities. Similarly, Karal and Hughes [11] found that autistic children with IQ scores over 70 had lower processing speed scores compared to their overall IQ. Although these studies have explored general problem-solving and processing speeds, there is limited research investigating processing speeds across different mathematical content areas.

This research aims to develop effective teaching methods to equip educators with the tools necessary to teach mathematical skills to autistic students. The specific objectives of this study are as follows:

- to evaluate the effectiveness of Applied Behavior Analysis (ABA) therapy in teaching

mathematical concepts to autistic students;

- to assess the impact of the Picture Exchange Communication System (PECS) on enhancing mathematical communication and understanding among autistic students;
- to compare the efficacy of educational games as a means of engaging autistic students inmathematical problem-solving.

**Methodsand materials**

**Research Design**

This study uses a comparative case study method to evaluate the effectiveness of three different methods of teaching mathematical learning to autistic students: Applied Behavior Analysis (ABA) therapy, image Exchange communication system (PECS), and educational games.These methods were chosen based on their widespread use in special education and the potential to improve the mathematical skills of children with autism.Thestudywas aimed at determining which method is most effective for nine autistic students between the ages of seven and twelve who attend the municipal state school "school-Lyceum No. 264 named after Takei Esetov" in Kyzylorda.

**Participants.** The study involved nine students: six girls and three boys, with age differences of seven and twelve years. Each student has unique characteristics that affect the learning environment.

**Student A (Female):**this student is overactive and speaks Kazakh, Russian, and English fluently. Despite her linguistic capabilities, her overactivity often disrupts classroom lessons, leading her to study individually. According to her teachers, her frequent outbursts make it challenging to integrate her into group lessons. Unauthorized absences from the classroom and making emotional noises during the lesson make it difficult to conduct the lesson.

Student B and Student C (Males):

Two of the three boys are good verbal communicators, but one has limited social interaction skills. They struggle with staying focused for more than 3-5 minutes, so they receive individualized instruction. These children often require redirection and cannot easily switch between tasks without assistance.

**Setting:**

The research was conducted in individual lesson settings. Each student received focused attention in one-on-one sessions to minimize distractions and better assess the impact of each teaching method.

**Data Collection Methods:**

The researcher compared the effectiveness of ABA therapy, PECS, and educational games as tools for teaching math. To conduct this comparison, individual lessons were held with each of the three students using these three different teaching approaches:

**1. ABA Therapy:**

Applied Behavior Analysis was used to teach mathematical concepts through structured, repetitive tasks, providing immediate feedback and reinforcement for correct answers.

1. **PECS:**

The Picture Exchange Communication System was employed to help students communicate mathematical ideas visually by using pictures to represent numbers and operations.

**2. Educational Games:**

Game-based learning activities were used to engage the students in mathematical problem-solving in an interactive and playful manner.

Each student participated in classes involving three teaching methods for eight weeks. Lessons were observed to assess students' attention, engagement, and understanding of math tasks presented in each instructional format.

**Data Collection and Evaluation**

The researcher gathered data through:

- **Observation:**

Each student's response to the three teaching methods was recorded, focusing on their ability to stay on task, grasp mathematical concepts, and their level of engagement with the material.

- **Performance Assessments:**

After each session, the students were given simple math problems to solve, and their success rate across the three methods was compared.

- **Teacher Feedback:**

In addition to observation, teachers were asked to provide input on the students' behavior, attention span, and performance improvements during the lessons.

**Data Analysis**

The collected data were analyzed through a comparative analysis framework. The performance of each student across the three methods (ABA therapy, PECS, and educational games) was compared to identify which approach yielded the most significant improvement in mathematical understanding and engagement. Key metrics for comparison included the length of focus time, accuracy of task completion, and the level of interest shown by each student during the lessons.

**Ethical Considerations**

Given that the participants are minors with autism, informed consent was obtained from their parents or guardians. The study followed ethical guidelines for working with vulnerable groups, ensuring the confidentiality of all data and the well-being of the participants throughout the research process.

**Results and Discussion**

**ABA Therapy in Teaching Math to Autistic Students**

Prior to initiating the experimental research, the researchers conducted a thorough information-gathering process regarding the selected participants. This involved reviewing each student's diagnosis and collecting supplementary data from their parents to gain a comprehensive understanding of the students' individual needs. Additionally, the researchers observed several math lessons to evaluate the teaching methods being used in practice [12]. These observations revealed that math teachers primarily employed traditional instructional approaches similar to those designed for neurotypical students. However, the nine autistic students engaged in these lessons for only about five minutes before becoming distracted and disengaging. In response, the teacher attempted to reintroduce new math tasks to regain their attention, but these attempts were largely ineffective, leading the teacher to cease further efforts. As a result, these students actively participated in math lessons for a maximum of approximately 15 minutes, exposing a significant gap in instructional methods tailored to autistic learners.

Drawing from her ten years of experience teaching math at the secondary level, the first researcher initially employed traditional teaching methods. However, she observed similarly limited engagement from the autistic students, mirroring the experiences of their regular math teacher. Recognizing the need for a different approach, she began experimenting with instructional methods that aligned with the interests of each student to foster stronger connections and increase engagement. For instance, one male student exhibited a notable interest and skill in chess, showcasing advanced cognitive abilities and strategic thinking during gameplay [12,13]. In addition, another student was seen to perform logic tasks quickly. Interestingly, in class, struggling with basic arithmetic, he demonstrated the skills of effective counting and calculation when playing chess. You can understand that another student, a woman, loves to draw, and this researcher is able to make various geometric shapes out of plaster. To develop and evaluate his mathematical abilities, the researcher called for a more detailed study of the elements of the figures, during which he demonstrated amazing strong mathematical skills. These observations led the researcher to conclude that interest-based teaching methods could significantly enhance engagement and task

completion during math lessons for autistic students, underscoring the need to expand beyond traditional instructional strategies.

To explore this further, the researcher incorporated nontraditional teaching methods widely adopted in Western educational systems, including Applied Behavior Analysis (ABA) therapy, the PECS method, and game-based learning.

ABA therapy is a widely recognized approach designed to help individuals with autism spectrum disorder (ASD) develop essential skills through the use of positive reinforcement to shape behavior. It offers several key advantages for academic learning in autistic individuals, particularly due to its structured, evidence-based approach. One of its primary benefits is individualized instruction, where learning strategies are tailored to meet the unique needs and abilities of each student. This personalized approach ensures students can progress at their own pace, reducing frustration and making learning more accessible. Another key feature is the use of positive reinforcement, which encourages desirable behaviors and skills by rewarding progress, thereby sustaining motivation and engagement over time. ABA therapy also emphasizes breaking down complex tasks into smaller, manageable steps—a process known as task analysis—which is especially effective in subjects like math, where multi-step processes are involved.

Moreover, ABA utilizes methods such as discrete trial training (DTT) and natural environment teaching (NET) to promote the generalization of learned skills. This means that students can apply their learning across different contexts, both within and outside the classroom. Techniques like prompt fading, which gradually reduce the support provided to students, are also essential in fostering independence in problem-solving and critical thinking. Collectively, these elements create a supportive learning environment in which autistic students can develop academic skills in a structured yet flexible manner, enhancing their overall academic success while also fostering essential social and communication skills critical for broader development.

ABA therapy has proven particularly effective when integrated into teaching environments for subjects like mathematics, where structured, repetitive, and reinforcement-based learning is essential. Through methods like task analysis, discrete trial training (DTT), and prompt fading, ABA therapy supports autistic students in breaking down complex math problems into smaller, more manageable steps. For example, task analysis helps deconstruct a multi-step math equation, allowing the student to focus on one element at a time, reducing cognitive overload. DTT, a one-on-one instructional technique, enables students to repeatedly practice and master each step, with immediate feedback and positive reinforcement provided for correct responses, thereby increasing the likelihood of retaining learned concepts.

Additionally, prompt fading gradually reduces external support as students gain confidence and competence, encouraging independence in solving math problems. By customizing the pace and teaching techniques to meet each student's specific needs, ABA therapy ensures that math instruction is adaptive and supportive, fostering an environment where autistic learners can excel academically. In contrast to traditional math teaching methods, which can often overwhelm autistic students with abstract concepts or rapid transitions, ABA therapy offers a tailored approach that ensures concepts are fully understood before advancing to the next step. This method not only improves mathematical understanding but also builds confidence and motivation, contributing to the long-term academic success of autistic students.

**PECS Method in Teaching Math to Autistic Students**

The Picture Exchange Communication System (PECS) is a visual communication method widely used with autistic individuals to enhance language and communication skills. However, it can also be effectively applied to teaching academic subjects such as math. PECS operates by allowing students to use pictures or symbols to express their thoughts, requests, or answers, making it especially useful for those who face challenges with verbal communication [14]. In the context of math education, PECS can be integrated by utilizing visual representations of numbers, equations, or mathematical concepts. This approach helps autistic students better comprehend

abstract ideas. For instance, when teaching basic arithmetic, students can use picture cards that represent numbers and mathematical operations (such as addition or subtraction) to physically construct and solve problems [15].

This hands-on, visual approach reduces the cognitive burden of language processing, allowing students to concentrate on the logical aspects of the task. Additionally, PECS fosters active participation as students are encouraged to exchange or select the appropriate visual representations during math activities, reinforcing both engagement and comprehension. As students advance, PECS can support the transition from concrete visual aids to abstract mathematical symbols, gradually building their confidence and ability to handle traditional math problems. By promoting independent problem-solving and alleviating frustration associated with communication barriers, PECS enables autistic students not only to grasp mathematical concepts but also to communicate their understanding effectively. This dual impact makes PECS a powerful tool for both educational and communicative development.

Visual supports play an integral role in teaching math to autistic learners by simplifying abstract concepts, reducing the demands of language processing, and enhancing understanding through tangible, visual representations. Many autistic students encounter difficulties with verbal instructions and abstract reasoning, which can make traditional math teaching methods less effective [16,17]. Incorporating visual aids such as charts, diagrams, number lines, and manipulatives helps educators present mathematical concepts in a way that is more concrete and relatable.

For example, visual supports can break down complex math problems into manageable steps, aiding comprehension of operations like addition, subtraction, or multiplication. These tools also benefit autistic students by providing consistent visual cues that can be referenced repeatedly, improving memory and retention. Furthermore, pictorial representations of math problems or sequences enhance engagement and focus, catering to the strengths of many autistic learners who often excel at processing visual information [14].

Visual schedules, task cards, and pictorial worksheets further increase a student's independence by reducing reliance on verbal prompts. The structured and predictable nature of visual aids also helps mitigate anxiety and frustration, fostering a more supportive and accessible learning environment. Ultimately, integrating visual supports into math education not only enhances academic performance but also builds confidence and autonomy in autistic learners, making math more approachable and comprehensible.

**Mathematical Games in Teaching Math to Autistic Students**

The Picture Exchange Communication System (PECS) is a widely recognized visual communication method commonly used with autistic individuals to improve language and communication skills. However, it is equally effective when applied to teaching academic subjects such as math. PECS allows students to use pictures or symbols to express their thoughts, requests, or answers, making it particularly valuable for those who face challenges with verbal communication [14]. In math education, PECS can be incorporated through visual representations of numbers, equations, or mathematical concepts. This method helps autistic students grasp abstract ideas more effectively. For example, when teaching basic arithmetic, students can use picture cards representing numbers and mathematical operations, such as addition or subtraction, to physically construct and solve problems [15].

This hands-on, visual approach alleviates the cognitive demands of language processing, allowing students to focus on the logic behind the tasks. Additionally, PECS encourages active engagement by requiring students to select and exchange the correct visual representations during math activities, which reinforces both comprehension and participation. As students progress, PECS facilitates the transition from concrete visual aids to more abstract mathematical symbols, gradually building their confidence and competence in solving traditional math problems. By fostering independent problem-solving and reducing frustration associated with communication

barriers, PECS helps autistic students not only grasp mathematical concepts but also effectively communicate their understanding. This dual role highlights PECS as a powerful tool for both educational advancement and communicative development.

Visual supports play an essential role in teaching math to autistic learners by simplifying abstract concepts, reducing language processing demands, and enhancing understanding through concrete representations. Many autistic students struggle with verbal instructions and abstract reasoning, which can make traditional math teaching methods less effective [16]. Incorporating visual aids such as charts, diagrams, number lines, and manipulatives helps educators present mathematical concepts in a tangible, relatable way.

For instance, visual supports can break down complex math problems into manageable steps, aiding in the understanding of operations like addition, subtraction, or multiplication. These tools also benefit autistic students by providing consistent visual cues that can be revisited, which enhances memory retention. Moreover, pictorial representations of math problems or sequences improve engagement and focus by leveraging the strengths of many autistic learners, who often excel at processing visual information [14].

Tools such as visual schedules, task cards, and pictorial worksheets further promote independence by reducing reliance on verbal prompts. Additionally, the structured and predictable nature of visual aids helps minimize anxiety and frustration, creating a supportive and accessible learning environment. Ultimately, integrating visual supports into math education not only improves academic performance but also fosters confidence and autonomy in autistic learners, making math more approachable and comprehensible.Overall, the research suggests that incorporating mathematical games, especially digital ones, as a supplement to traditional teacher-led instruction can be an effective strategy for enhancing the math skills of autistic students.The researchers selected three game apps that were suitable for the research participants and aligned with the school curriculum: MathKids, NumberKids, and 123Numbers.

Through the mobile application, games are shown that improve students ' interest in mathematicsin  Figure 1.


**Figure 1 – Students perform mathematical tasks through a mobile application**

Together with the student, it is shown to perform mathematical tasks through a mobile application. in Figure 2.

**Figure 2 – Teach math to students through a mobile app**

The researchers observed that students with autism spectrum disorder (ASD) frequently struggle with maintaining focus on various tasks, underscoring the importance of employing diverse teaching approaches to avoid overwhelming them. To address this challenge, the researchers utilized motivation techniques from Applied Behavior Analysis (ABA) therapy when assigning math tasks. This approach helped students with ASD complete tasks aligned with the school curriculum. Inaddition, the method of educational games turned out to be very effective, as it used the natural power of autistic students in visual processing.I would like to say that it is an indispensable method for stabilizing the attention of autistic students [18].

When participants displayed signs of boredom or disengagement, math games were introduced to successfully re-engage them and maintain their motivation to continue learning. The students responded enthusiastically to the games, demonstrating heightened focus and interest in completing the math tasks. Based on these observations, the study concluded that a combination of ABA therapy, the PECS method, and math games effectively supported student engagement and task completion. The findings suggest that these methods should be integrated into instructional strategies for teaching math to students with ASD [19-20].

**Conclusion.** This study highlights the critical importance of incorporating diverse instructional methods—specifically Applied Behavior Analysis (ABA) therapy, the Picture Exchange Communication System (PECS), and educational games—into teaching mathematics to students with autism spectrum disorder (ASD). Each of these approaches draws upon distinct strengths to address the unique challenges autistic students face when engaging with traditional math instruction.

ABA therapy offers structured and highly individualized learning experiences, utilizing positive reinforcement techniques to sustain engagement and improve task completion. The PECS method leverages the visual learning preferences of autistic students, aiding their ability to understand and communicate mathematical concepts more effectively. Meanwhile, educational games provide an interactive and engaging platform for reinforcing math skills, keeping students motivated and focused.

When applied in combination, these approaches were found to significantly enhance students' engagement, comprehension, and success in completing math-related tasks. The positive outcomes underscore the value of integrating these evidence-based methods into instructional practices for teaching math to students with ASD.

In light of these findings, it is strongly recommended that educators adopt and implement ABA therapy, PECS, and educational games as part of their teaching strategies to create a more inclusive and effective learning environment for autistic students. Future research should focus on exploring the long-term effects of these methods on academic outcomes and evaluating their applicability across various educational settings and subject areas.

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## ОБУЧЕНИЕ АВА-ТЕРАПИИ, PECS И ОБРАЗОВАТЕЛЬНЫМ ИГРАМ ДЕТЯМ С РАССТРОЙСТВАМИ АУТИСТИЧЕСКОГО СПЕКТРА

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**Аннотация.** В данном исследовании рассматривается эффективность трех методов обучения – терапии прикладного поведенческого анализа (ABA), системы обмена изображениями для общения (PECS) и образовательных игр - при обучении математике учащихся с расстройством аутистического спектра (ASD). Однако по-прежнему существует нехватка структурированных методик для обучения специализированным предметам, таким как математика, для учащихся с аутизмом. Это исследование использовало сравнительный подход к изучению случаев с участием трех семилетних учеников с аутизмом, чтобы оценить влияние каждого метода на их вовлеченность, понимание и выполнение математических задач. Результаты показали, что каждый из подходов уникально способствовал преодолению трудностей учащихся в математике. Терапия ABA предоставила структурированную, основанную на подкреплении учебную среду, которая способствовала завершению задач; PECS использовала визуальную коммуникацию, соответствуя сильным сторонам аутичных учащихся как визуальных учеников; а образовательные игры успешно поддерживали мотивацию и вовлеченность. Результаты исследования показывают, что использование комбинации этих методов значительно улучшает учебный опыт и математические навыки у учащихся с аутизмом. Исследование рекомендует педагогам внедрять эти основанные на доказательствах практики для создания более инклюзивной и эффективной учебной среды для

учащихся с ASD. Рекомендуется также проведение дальнейших исследований для изучения долгосрочного влияния этих методов в разных предметных областях и образовательных условиях.

**Ключевые слова:** расстройство аутистического спектра, инклюзивное образование, прикладной поведенческий анализ, система коммуникации с помощью обмена картинками, развивающие игры, обучение математике, математические способности, математические концепции.

## АУТИЗМ СПЕКТРІ БҰЗЫЛҒАН БАЛАЛАРҒА ABA ТЕРАПИЯСЫН, PECS ЖӘНЕ БІЛІМ БЕРУ ОЙЫНДАРЫН ОҚЫТУ

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**Аңдатпа.** Бұл мақалада үш оқыту әдісі, қолданбалы мінез-құлық талдауы (Applied Behavior Analysis - ABA) терапиясы, сурет алмасу қарым-қатынас жүйесі (Picture Exchange Communication System - PECS) және білім беру ойындары, аутистік спектрі бұзылысы (autism spectrum disorder - ASD) бар оқушыларға математиканы оқыту тиімділігін зерттейді. Аутистік спектрі бұзылысы бар оқушыларға математика сияқты бейіндік пәндерді оқытудың құрылымдық әдістемелері әлі де жеткіліксіз. Аталмыш әдістертің математикалық тапсырмаларды орындауға және түсінуге әсерін бағалау үшін жеті жасар үш аутистік спектрі бұзылысы бар оқушылармен салыстырмалы кейс-стади әдісі қолданылып, зерттеу жүргізілді. Зерттеу нәтижелері әр әдістің оқушылардың математиканы оқудағы қиындықтарды жеңуге ерекше үлес қосқанын көрсетті. ABA терапиясы тапсырманың құрылымдық орындалуын жақсартады, ал PECS аутистік спектрі бұзылысы бар оқушылардың визуалды оқушылар ретіндегі күшті жақтарына сәйкес келетін визуалды коммуникацияны пайдаланды және білім беру ойындары мотивация мен белсенділікті сәтті қамтамасыз етті. Зерттеу нәтижелері осы аталған әдістерді біріктіре қолданып аутистік спектрі бұзылысы бар оқушылардың оқу тәжірибесі мен математикалық дағдыларын айтарлықтай жақсартатынын көрсетеді сонымен қатар, инклюзивті және тиімді оқу ортасын құру үшін осы дәлелді тәжірибелерді қолдануды ұсынады. Осы әдістердің әртүрлі пәндік бағыттар мен білім беру мекемелеріне ұзақ мерзімді әсерін зерттеу үшін қосымша зерттеулер жүргізу ұсынылады. Зерттеу мұғалімдерге ASD бар оқушылар үшін дәлелді тәжірибелерді қолдануды ұсынады. Әртүрлі пәндік салалар мен білім беру параметрлері бойынша осы әдістердің ұзақ мерзімді әсерін зерттеу үшін келешекте зерттеу жұмыстарын жалғастыру ұсынылады.

**Тірек сөздер:** аутистік спектрі бұзылысы, инклюзивті білім беру, қолданбалы мінез-құлық талдауы, сурет алмасу қарым-қатынас жүйесі, оқу ойындары, математиканы оқыту, математикалық қабілет, математикалық ұғымдар.