International Journal of Evaluation and Research in Education (IJERE)
Vol. 14, No. 4, August 2025, pp. 2902~2912
ISSN: 2252-8822, DOI: 10.11591/ijere.v14i4.31955

Improving preschooler's adaptation through game-based technologies

Gulnur Kilybayeva[1], Ulbossyn Kyyakbayeva[1], Raissa Izmagambetova[1], Gulmira Myshbayeva[2], Roza Bekmagambetova[1], Saniya Nurgaliyeva[1]
[1]Department of Preschool Education and Social Pedagogy, Faculty of Pedagogy and Psychology, Abai Kazakh National Pedagogical University, Almaty, Kazakhstan
[2]Faculty of Education and Humanities, Suleyman Demirel University (SDU), Kaskelen, Kazakhstan

Article Info

Article history:

Received Jul 4, 2024
Revised Dec 3, 2024
Accepted Mar 1, 2025

Keywords:

Adaptation
Children
Enhancing
Game-based technologies
Preschool settings

ABSTRACT

Preschool years are critical for a child's future learning and development. One of the most important challenges when a child enters kindergarten is adaptation. Negative experiences during this period might affect a child's adaptation to school and may have long-term consequences. Leveraging game-based technologies can transform early education, making it more engaging, personalized, and effective, thus ensuring better preparedness for formal schooling. This study evaluates the effectiveness of game-based technologies in improving the social, emotional, and cognitive adaptation of young children to preschool settings in Kazakhstan. By employing a comprehensive mixed-methods approach, this research provides robust evidence of the efficiency of game-based technologies in supporting young children's adaptation to preschool environments in Kazakhstan. The study included two groups of children: an experimental group (EG) (n=70) and a control group (CG) (n=70). The positive outcomes suggest that incorporating game-based learning into early childhood education can considerably improve the overall preschool experience, and better prepare children for future academic challenges. The study's findings provide valuable guidance for educators looking to improve early childhood education.

Corresponding Author:

Saniya Nurgaliyeva
Department of Primary Education and Social Pedagogy, Faculty of Pedagogy and Psychology
Abai Kazakh National Pedagogical University
Dostyk ave., 13, Almaty, Kazakhstan
Email: sanianurgalieva77@gmail.com

1. INTRODUCTION

The adaptation of a child to new environmental conditions is a challenging and often stressful process. This transition is frequently accompanied by several negative changes in the child's body, which can affect various levels of their well-being and potentially lead to stress. Getting a preschooler accustomed to kindergarten is particularly difficult since the adaptive capabilities of a young child are limited. An optimal adaptation period is ensured by a smooth transition from the family environment to the preschool institution, facilitated by close collaboration between specialists, teachers, and parents. During this period, teachers play an important role in supporting the child. To reduce stress, it is essential to engage the child in activities that bring them pleasure. For preschool-aged children, this primarily means play. By focusing on game-based activities, educators can help children adjust more comfortably to their new surroundings, making the adaptation process less daunting and more enjoyable. Through play, children can express their emotions and

experiences, communicate with peers, become familiar with societal norms and rules, and gain inner freedom. Play considerably eases and improves the adaptation process for young children. Therefore, properly organized play activities that foster emotional connections between "child-adult" and "child-child," including games and exercises, can help smooth the adaptation process for a child entering kindergarten for the first time.

As children transition from home to preschool, they encounter new environments, routines, and social dynamics, which can be both exciting and challenging. A successful transition can lead to greater engagement, positive attitudes toward learning, and overall well-being, whereas a difficult transition can result in anxiety, withdrawal, and long-term academic challenges [1], [2]. The adaptation process is crucial, as it sets the tone for a child's future educational experiences. Therefore, it is essential to find effective strategies to support young children during this critical period [3], [4]. A promising approach is the use of game-based technologies. These technologies encompass a wide range of digital and interactive tools designed to create engaging and immersive learning experiences. By incorporating elements of play, game-based technologies can make the adaptation process more enjoyable and less intimidating for young children [5], [6]. Integrating technology into this play can further enhance these benefits, providing additional support and resources for both children and educators [7].

In Kazakhstan, adapting young children to preschool settings has become a focal point for educators, aiming to ensure that this transition is as smooth and beneficial as possible [3], [8]. These challenges can impede children's adaptation to preschool settings, affecting their well-being and future educational outcomes [9], [10]. Game-based technologies offer a potential solution to these challenges by providing an engaging and interactive approach to learning [11], [12]. However, there is limited research and practical guidance on effectively integrating these technologies within Kazakhstan's preschool education system. This research highlights the conflict between the need to improve young children's adaptation to preschool and the insufficient focus on using game-based technologies to address this need. The key question is whether game-based technologies improve adaptation, and if so, how this improvement occurs. Despite the importance of this issue, existing literature has not adequately addressed the role of game-based technologies in aiding young children's adaptation to preschool settings. This study is of importance as it explores the potential of game-based technologies to facilitate smoother transitions for young children entering preschool settings [13]. The research findings offer practical strategies for Kazakhstani educators, enabling them to create more engaging, supportive, and effective learning environments [14]. The study was conducted to answer the research questions: how can game-based technologies facilitate young children's adaptation to preschool settings?

2. THE COMPREHENSIVE THEORETICAL BASIS

Numerous scholarly investigations have examined the principal obstacles encountered by young children as they adjust to preschool environments, revealing a range of challenges that can affect their adjustment process [15]. Briggs-Gowan *et al.* [16] identified separation anxiety as a significant issue, where children experience distress when separated from their primary caregivers. Huang *et al.* [17] highlighted the challenge of unfamiliarity with new environments, noting that children often struggle to adjust to new classrooms, teachers, and peers, leading to feelings of insecurity and reluctance to engage in group activities. Research by Merki *et al.* [18] focused on the difficulties children face in adapting to new routines and expectations. Social skill development is another critical challenge, as identified by Zheng *et al.* [19]. Finally, emotional responses to new social dynamics and expectations were explored in a study by Klopfer *et al.* [20].

The research conducted by Storli and Sandseter [21] focused on the emotional benefits of game-based learning. Martinez *et al.* [22] examined how educational games influence cognitive development. A comprehensive review by Alotaibi [23] analyzed various studies on digital play and learning. Case studies in preschool settings, such as those conducted by Kim *et al.* [24] have demonstrated practical applications of game-based technologies. Behnamnia *et al*. [25] reported that interactive apps and digital games designed for young children can considerably enhance learning and adaptation. Baek and Touati [26] emphasized the benefits of collaborative and multiplayer games in fostering social skills. These interactions help children develop essential social competencies, such as sharing, taking turns and problem solving, which are crucial for adapting to the preschool environment [27]. These technologies can reduce anxiety and build confidence by familiarizing children with new concepts and environments in a safe and controlled manner [28], [29]. Thus, while most existing studies provide short-term results, understanding the sustained impact of these technologies is crucial for developing effective educational game-based strategies.

3. METHOD

3.1. Research methods and collection of research samples

By employing a comprehensive mixed methods approach, this research provides robust evidence of the effectiveness of game-based technologies in supporting young children's adaptation to preschool settings in Kazakhstan. Adaptive learning algorithms were used to personalize game experiences for each child, ensuring that difficulty and content were suitable for their developmental stage. The study involved a sample of preschool children aged three to five years, along with their parents and preschool educators from Kindergarten 102 and Kindergarten 42 in Almaty, Kazakhstan. The sample included two groups of children: an experimental group (EG) (n=70) and a control group (CG) (n=70). Table 1 shows the descriptive data the respondents provided. It guarantees that a variety of experiences and institutional contexts are represented in the study's conclusions.

Table 1. Descriptive data of responders

Variable	EG (n=70)	CG (n=70)	Total (N=140)
Age (years)	3-5	3-5	3-5
Gender (male/female)	35/35	36/34	71/69
Previous preschool experience	30 with/40 without	32 with/38 without	62 with/78 without

3.2. Experimental process

The experimental procedure is explained in detail in Figure 1. The comprehensive approach to implementing game-based learning is emphasized by steps like teacher training, continuous support, feedback, and evaluation. In addition to quantifying each phase's complexity, this representation offers qualitative insights into how each step affects the experiment's overall structure and success. The fact that parental participation is included highlights how cooperative the strategy is.

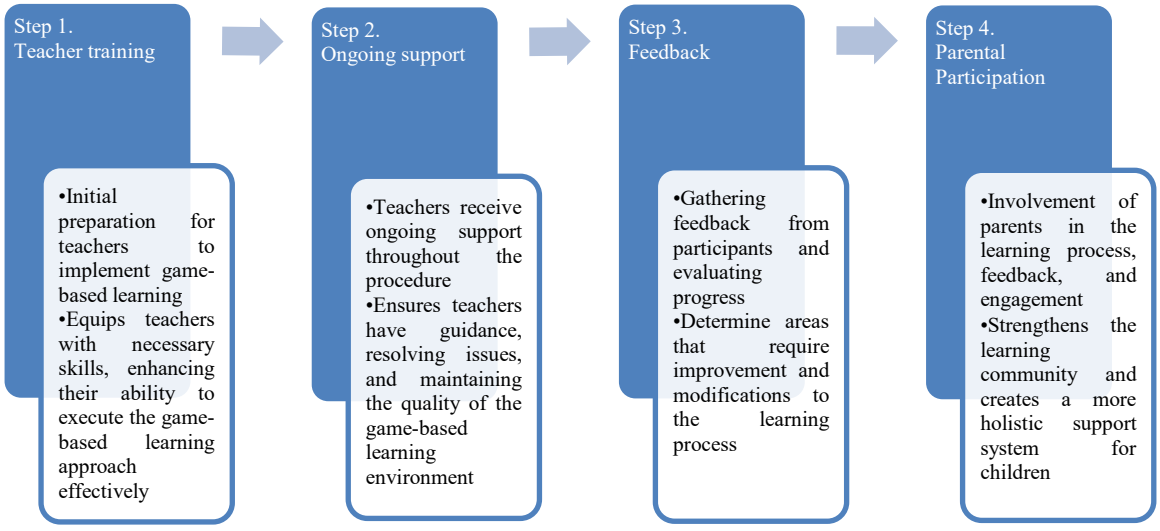

Figure 1. The experimental procedure

3.3. Implementation of game-based technologies

Over six months, the EG integrated selected game-based technologies into their daily preschool activities. The specific goals of game technologies in the design and development approach are: i) creating engaging and educational game content; ii) promoting social interaction and collaborative play; iii) implementing adaptive learning technologies; iv) ensuring accessibility and inclusiveness; and v) integrating comprehensive assessment tools. These technologies included interactive apps, collaborative digital games, and AR/VR tools, all designed to enhance social, emotional, and cognitive skills. The CG continued with traditional preschool activities. Table 2 presents the implementation of game-based technologies in EG over six months.

The intervention was seamlessly integrated into the regular preschool curriculum, ensuring that it did not disrupt other educational activities. By focusing on designated playtime sessions, the implementation

capitalized on periods when children are naturally more engaged and receptive to interactive learning. The variety of technologies used addressed different developmental areas, offering a comprehensive approach to improving social, emotional, and cognitive skills. Continuous monitoring and support were provided to educators and parents in the EG to address challenges and ensure the effective implementation of the technologies. A midpoint review was conducted after three months to assess the progress of children in both groups. Based on the findings, adjustments and additional support were provided. After six months, a final assessment was conducted using the same standardized tools to measure changes in children's social, emotional, and cognitive skills. This evaluation aimed to compare the progress of children in the EG with those in the CG. Sample schedule for implementation is presented in Table 3.

Table 2. The intervention program

Aspect	Details
Frequency and duration	Conducted during designated playtime sessions, three times a week for 30 minutes each session
Duration of intervention	Six months
Technologies used	Interactive apps, collaborative digital games, AR/VR tools
Educational focus areas	Social, emotional, and cognitive skills
Interactive apps	Apps like “Endless Alphabet” and “ABCmouse” to enhance literacy and numeracy skills
Collaborative digital games	Games like “Minecraft: Education Edition” and “Osmo” to promote teamwork and problem-solving
AR/VR tools	Tools like “Quiver” for immersive learning experiences and familiarization with new concepts
Educator training	Comprehensive training on the pedagogical application of game-based technologies
Parental involvement	Workshops and resources provided to parents to support game-based learning at home
Ongoing monitoring and support	Continuous monitoring and support for educators and parents to address challenges and ensure effectiveness

Table 3. Sample schedule for implementation

Day	Activity
Monday	Interactive apps: literacy-focused activities using “Endless Alphabet”
Wednesday	Collaborative digital games: team-based problem-solving with “Minecraft: Education Edition”
Friday	AR/VR tools: immersive learning with “Quiver”

3.4. Methods of incorporating games in learning

Table 4 shows a structured overview of how to incorporate games into learning, with a focus on both classroom and home settings. This framework represents a practical strategy for improving children's learning outcomes through interactive and meaningful play. The outlined categories highlight a variety of approaches, such as group and individual play, adult involvement, and home-based activities, allowing for flexibility in application. Collaborative and guided games in group play promote social interaction and teamwork, whereas personalized learning via apps and teacher support in individual play addresses specific educational needs. Adult involvement, such as instruction, observation, and feedback, improves the learning process by providing guidance and reinforcement. Home-based methods, such as family game nights and guided or self-directed play, encourage participation and continuity between school and home.

3.5. Instruments and data collection

Table 5 summarizes the instruments and data collection methods used in the study. It categorizes the information, emphasizing key focus areas and specific questions raised. This structured approach ensures a thorough understanding of the tools and techniques used to gather relevant data.

Table 4. Methods of incorporating games in learning

No	Category	Method	Description
1	Group play	Collaborative games	Fosters teamwork, communication, and social interaction through cooperative games
		Guided sessions	Teachers facilitate games, ensuring participation and oversight
2	Individual play	Personalized learning	Uses game-based learning apps tailored to individual learning need
		Teacher support	Teachers provide one-on-one support and encouragement during play
3	Adult involvement	Instruction and guidance	Teachers provide instructions and rules to guide the sessions
		Observation and feedback	Teachers observe, offer feedback, and reinforce learning outcomes
4	Home use - individual play	Homework assignments	Game-based activities assigned as homework to reinforce learning
		Parental involvement	Parents assist with the environment, technical issues, and motivation
5	Home use - group play	Family game nights	Families play multiplayer games together to promote cooperation
6	Home use - instructions and prompts	Guided play	Parents receive teacher guidance for setting up and supporting play
		Autonomous play	Encourages independent learning with initial instructions provided

Table 5. Instruments

No	Category	Focus area	Question
1	Educators' interview questions	Implementation and integration	How would you assess the overall effectiveness of game-based technologies in your classroom?
		Skill development	Can you describe any improvements in children's cognitive skills attributed to game-based technologies?
		Implementation and integration	What challenges have you encountered in incorporating game-based technologies into your curriculum?
		Support and training	How effective was the training you received on using game-based technologies?
		Observations and feedback	What feedback have you received from parents regarding the use of game-based technologies in the classroom?
2	Parents' interview questions	Engagement and adaptation	How has your child's attitude toward preschool shifted since the introduction of game-based technologies?
		Skill development	Can you provide examples of any cognitive improvements attributed to game-based technologies?
		Home-preschool connection	How do you support your child's learning with game-based technologies at home?
		Concerns and suggestions	Do you have any concerns about the amount of screen time your child experiences with game-based technologies?
		Feedback and recommendations	What feedback have you provided to the preschool regarding the use of game-based technologies?

3.6. Reliability and validity

The reliability coefficient, commonly denoted by Cronbach's alpha, reflects how effectively the items on a scale measure the same underlying construct, as shown in Table 6. The high reliability coefficients demonstrate that the social skills scale exhibits excellent internal consistency before and after the intervention. The cognitive skills scale is highly reliable, consistently measuring cognitive abilities, including problem-solving and attention. The reliability coefficients for the social, emotional, and cognitive skills scales used in this study are all above 0.85, indicating high internal consistency. This suggests that the scales are reliable tools for measuring these skills in young children, both before and after the intervention. The consistent reliability coefficients before and after the intervention further underscore the robustness of the scales used in this study.

Table 6. Reliability coefficient (Cronbach's alpha)

Skill area	Number of items	Cronbach's alpha (pre-intervention)	Cronbach's alpha (post-intervention)
Social skills	10	0.87	0.89
Emotional skills	8	0.85	0.88
Cognitive skills	12	0.88	0.90

3.7. Data analysis

Quantitative data from pre- and post-intervention evaluations were analyzed to assess significant changes and correlations in children's adaptation levels. Statistical methods, including paired t-tests and analysis of variance or ANOVA, were employed to ensure robust analysis. The data processing was conducted using SPSS 24.0, a widely recognized statistical software package for social sciences, to enhance the reliability and precision of the results.

4. RESULTS AND DISCUSSION

Table 7 shows the results of the early childhood environment rating scale (ECERS) and the social skills improvement system (SSIS) assessments. EG's social skills improved significantly, increasing by 17.1 points, while CG's increased by 5.7 points. The EG also made significant progress, improving their emotional skills by 17.8 points, while the CG only improved by 6.2 points. The intervention helped children improve their emotional management and reduce their anxiety as they transitioned to preschool. The EG significantly improved cognitive skills, increasing by 18.8 points compared to the CG 7.8-point increase. This demonstrates that game-based technologies effectively supported the development of cognitive abilities such as problem-solving, attention, and memory.

The mean scores, standard deviations, and statistical significance for every skill area in the EG and CG are shown in Table 8. With a mean change of +17.1 points, EG showed a statistically significant ($p<0.001$) improvement in social skills. Although it was less pronounced, the CG also improved, with a mean change of +5.7 points ($p<0.05$). The results of the ANOVA show a significant difference between the groups

(F(1,138)=45.32, p<0.001), indicating that the intervention significantly improved social skills. With a mean change of +17.8 points (p<0.001), the EG demonstrated a significant improvement in emotional skills, while the CG showed a change of +6.2 points (p<0.05). The ANOVA findings (F (1,138)=49.87, p<0.001) provide additional evidence of the intervention's noteworthy effect on emotional intelligence. While CG showed a mean change of +7.8 points (p<0.05), EG showed a significant improvement in cognitive skills, with a mean change of +18.8 points (p<0.001). The ANOVA results show a significant difference between the groups (F(1,138)=52.14, p<0.001), demonstrating how well game-based technologies can improve cognitive abilities.

Table 7. The results of the ECERS and the SSIS

Skill area	Assessment tool	EG (n=70)	CG (n=70)
Social skills	SSIS		
Baseline score		55.2	54.8
Final score		72.3	60.5
Change		+17.1	+5.7
Emotional skills	ECERS		
Baseline score		50.6	51.0
Final score		68.4	57.2
Change		+17.8	+6.2
Cognitive skills	ECERS		
Baseline score		52.1	51.8
Final score		70.9	59.6
Change		+18.8	+7.8

Table 8. The mean scores, standard deviations, and statistical significance for each skill area

Skill area	Group	Pre-intervention mean (SD)	Post-intervention mean (SD)	Mean change	Paired t-test (p-value)	ANOVA (F-value, p-value)
Social skills	Experimental	55.2 (4.5)	72.3 (5.0)	+17.1	<0.001	45.32, p<0.001
	Control	54.8 (4.8)	60.5 (5.2)	+5.7	<0.05	
Emotional skills	Experimental	50.6 (4.7)	68.4 (4.9)	+17.8	<0.001	49.87, p<0.001
	Control	51.0 (4.6)	57.2 (4.8)	+6.2	<0.05	
Cognitive skills	Experimental	52.1 (4.6)	70.9 (5.1)	+18.8	<0.001	52.14, p<0.001
	Control	51.8 (4.9)	59.6 (5.0)	+7.8	<0.05	

4.1. Results of thematic analysis from educators' interviews

Thematic analysis of educator interviews, summarized in Table 9, reveals both the benefits and challenges of incorporating game-based technologies into early education. Key themes include increased engagement and motivation, with educators observing that interactive activities significantly boost children's participation and excitement. Social skills also improved as teamwork-based games encouraged children to communicate and cooperate more effectively. Emotional regulation was another significant outcome, with games assisting children in reducing anxiety and increasing confidence. Cognitive development resulted in improvements in problem-solving abilities, attention spans, and flexibility, demonstrating the educational potential of such tools. However, the implementation encountered difficulties, particularly technical issues and the need for ongoing teacher training, emphasizing the importance of adequate support for successful integration. Overall, the findings highlight the transformative potential of game-based learning, as long as logistical and training barriers are overcome.

4.2. Results of thematic analysis from parents' interviews

Table 10 summarizes the thematic analysis of parent interviews. Parents reported positive behavioral changes in their children, such as improved social interactions, cooperation, and emotional regulation. Increased engagement and enjoyment were also observed, with children expressing greater enthusiasm for preschool and participating in activities. Furthermore, parents appreciated the resources available for home-based learning, which strengthened the link between home and preschool education. However, concerns about screen time and equitable access to technology arose, highlighting the need to balance digital exposure while also addressing resource disparities. These findings highlight the importance of taking a comprehensive approach to integrating technology, ensuring that it supports children's development while also addressing parental concerns.

Table 9. Thematic analysis from educators' interviews

No	Theme	Key insights	Sample quotes
1	Enhanced engagement and motivation	Increase in children's participation and eagerness to engage due to interactive and playful nature of game-based technologies	Ms. Firuza (Teacher, Kindergarten 102): "*Children are always excited for game time. It's amazing to see them so engaged and eager to participate*."
2	Development of social skills	Improved communication and cooperation among children through teamwork-focused activities	Ms. Zara (Teacher, Kindergarten 102): "*I have seen a big improvement in how children interact with each other. They are learning to work together and communicate better*."
4	Emotional regulation	Reduced anxiety, improved confidence, and better emotional regulation during game-based activities	Ms. Gulmira (Teacher, Kindergarten 102): "*Children seem less anxious and more confident when they are using games*."
	Cognitive development	Enhanced problem-solving skills, attention spans, and cognitive flexibility with game-based puzzles and challenges	Ms. Mira (Teacher, Kindergarten 102): "*The games have really helped improve their problem-solving skills. They approach challenges more thoughtfully now*."
	Implementation challenges	Technical issues and need for ongoing training to address implementation challenges	Ms. Gulsum (Teacher, Kindergarten 102): "*We did face some technical problems, but with support, we managed to overcome them*."

Table 10. Thematic analysis from parents' interviews

No	Theme	Key insights	Sample quotes
1	Positive behavioral changes	Improved social interactions, cooperative behaviors, and emotional regulation among children	Malika: "*My child interacts more positively with peers now*."
2	Increased engagement and enjoyment	Children are more enthusiastic about attending preschool and enjoy game-based activities	Madina: *"My child is always excited to go to preschool now*."
3	Support for learning at home	Parents appreciated resources for home-based learning, strengthening the home-preschool connection	Azamat: "*The continuity between home and school has been great*."
4	Concerns about screen time	Concerns about balancing screen time and ensuring equitable access to technology	Erbol: "*Access to technology can be a challenge, but we managed with the resources provided*."

Table 11 presents a comprehensive comparison of parents' and educators' perspectives, highlighting areas of agreement and disagreement across key themes. Both groups agree that game-based learning improves engagement, social skills, and emotional regulation, though the contexts of these observations differ—educators focus on the classroom, whereas parents focus on the home. Another common theme is cognitive development, but educators emphasize problem-solving and focus, whereas parents emphasize behavioral changes. The significance of the home-school connection is widely acknowledged, with parents appreciating resources that link school and home learning. However, divergence is evident in the challenges: educators emphasize the need for technical support and training, whereas parents are more concerned with screen time management and equitable access to technology.

Table 11. Comparison of perspectives: parents vs. educators

No	Theme	Educators' perspective	Parents' perspective	Agreement/divergence
1	Engagement and Motivation	Children show eagerness and participate more actively	Children are excited about preschool and enjoy activities	Agreement on increased engagement but educators focus on classroom participation
2	Social skills	Improved communication and teamwork among children	Better social interactions and cooperative behavior observed at home	Agreement on improved social skills, seen in different contexts (school vs. home)
3	Emotional regulation	Reduced anxiety and increased confidence during activities	Children manage emotions and frustrations more effectively	Both note better emotional regulation but parents emphasize at-home impact
4	Cognitive development	Enhanced problem-solving skills and focus through game-based activities	Recognized cognitive growth but focused on behavioral outcomes	Educators highlight cognitive improvements, while parents focus more on behavior
5	Home-school connection	Alignment between traditional and game-based learning methods	Valued resources and guidance for home-based learning	Agreement on the importance of home-preschool connection
6	Challenges	Need for technical support and ongoing professional training	Concerns about screen time and equitable access to technology	Divergence: Educator's stress technical support, parents focus on screen time

4.3. Challenges and considerations

Despite the positive results, several challenges emerged during the implementation of game-based technologies. Some educators reported technical issues, such as software glitches and limited access to adequate devices. These challenges underscore the need for reliable technology infrastructure and robust technical support in preschools to ensure smooth implementation. Although initial training was provided, educators expressed a need for ongoing professional development to remain current with new technologies and best practices. Continuous training can help educators fully leverage game-based learning tools and address any emerging challenges. Both educators and parents raised concerns about the amount of screen time associated with game-based technologies. Some parents highlighted challenges related to equitable access to devices and internet connectivity. Ensuring that all children have access to the necessary technology is crucial for the success of game-based learning interventions.

The study identified several important outcomes. They are: i) Increased engagement: children showed greater engagement and motivation to participate in activities involving game-based technologies compared to traditional methods; ii) Enhanced social interaction: the games fostered cooperative play and improved social interactions among peers, leading to development of better social skills; iii) Improved cognitive skills: the study observed important progress in children's cognitive development, including enhancements in problem-solving and critical thinking skills; iv) Emotional regulation: children demonstrated an improved ability to manage their emotions and showed greater resilience in stressful situations; and v) positive feedback from educators: teachers have indicated that game-based technologies serve as effective tools in facilitating children's adaptation processes. These technologies also offer valuable insights into each child's learning progress.

5. CONCLUSION

The study examined the effectiveness of game-based technologies in improving young children's adaptation to preschool settings in Kazakhstan. The article confirms that game-based technologies significantly enhance young children's adaptation to preschool settings by improving their social skills, emotional regulation, and cognitive development. The game-based technologies offer a promising solution for enhancing young children's adaptation to preschool settings. The findings are consistent with the research goals of this article, and future research efforts could consider more game-based educational strategies to balance digital and traditional play and learning activities, ensuring a well-rounded preschool experience for children. This study not only validates existing theories but also contributes to the broader field of game-based technologies by providing evidence-based recommendations tailored to the cultural and educational context of Kazakhstan.

FUNDING INFORMATION

This study received no specific financial support.

AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Gulnur Kilybayeva	✓	✓	✓	✓	✓	✓		✓	✓	✓			✓	
Ulbossyn Kyyakbayeva		✓				✓		✓	✓	✓	✓	✓		
Raissa Izmagambetova	✓		✓	✓		✓			✓		✓		✓	
Gulmira Myshbayeva	✓	✓	✓	✓	✓	✓		✓	✓	✓			✓	✓
Roza Bekmagambetova					✓		✓			✓		✓		✓
Saniya Nurgaliyeva	✓	✓	✓	✓	✓	✓		✓	✓	✓			✓	

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

ETHICAL APPROVAL

The Ethical Committee of the Academic Council, Abai Kazakh National Pedagogical University, Kazakhstan has granted approval for this study 14 September 2024 (Ref. No. 7).

DATA AVAILABILITY

The corresponding author may provide study data upon reasonable request.

REFERENCES

[1] V. E. Vitiello, T. Nguyen, E. Ruzek, R. C. Pianta, and J. V. Whittaker, "Differences between pre-k and kindergarten contexts and achievement across the kindergarten transition," *Journal of Applied Developmental Psychology*, vol. 80, p. 101396, 2022, doi: 10.1016/j.appdev.2022.101396.

[2] M. Burchinal, R. Pianta, A. Ansari, J. Whittaker, and V. Vitiello, "Kindergarten academic and social skills and exposure to peers with pre-kindergarten experience," *Early Childhood Research Quarterly*, vol. 62, pp. 41–52, 2023, doi: 10.1016/j.ecresq.2022.07.012.

[3] K. Sabolova, N. Birdsey, I. Stuart-Hamilton, and A. L. Cousins, "A cross-cultural exploration of children's perceptions of wellbeing: Understanding protective and risk factors," *Children and Youth Services Review*, vol. 110, p. 104771, Mar. 2020, doi: 10.1016/j.childyouth.2020.104771.

[4] K. Nand, N. Baghaei, J. Casey, B. Barmada, F. Mehdipour, and H.-N. Liang, "Engaging children with educational content via Gamification," *Smart Learning Environments*, vol. 6, pp. 1–15, 2019, doi: 10.1186/s40561-019-0085-2.

[5] R. Parker, B. S. Thomsen, and A. Berry, "Learning Through Play at School – A Framework for Policy and Practice," *Frontiers in Education*, vol. 7, p. 751801, 2022, doi: 10.3389/feduc.2022.751801.

[6] A. Rademacher and U. Koglin, "The concept of self-regulation and preschoolers' social-emotional development: a systematic review," *Early Child Development and Care*, vol. 189, no. 14, pp. 2299–2317, 2019, doi: 10.1080/03004430.2018.1450251.

[7] T. Talan, Y. Doğan, and V. Batdı, "Efficiency of digital and non-digital educational games: A comparative meta-analysis and a meta-thematic analysis," *Journal of Research on Technology in Education*, vol. 52, no. 4, 2020, doi: 10.1080/15391523.2020.1743798.

[8] F. Polat *et al.*, "Factors affecting multi-stakeholders perspectives towards inclusive early childhood education (IECE) in Kazakhstan," *Children and Youth Services Review*, vol. 155, p. 107224, 2023, doi: 10.1016/j.childyouth.2023.107224.

[9] M. Mclaughlin, A. Nathan, A. Thornton, J. Schipperijn, S. G. Trost, and H. Christian, "Adaptations to scale-up an early childhood education and care physical activity intervention for real-world availability — Play Active," *International Journal of Behavioral Nutrition and Physical Activity*, vol. 20, no. 1, p. 65, Jun. 2023, doi: 10.1186/s12966-023-01457-7.

[10] R. Riad, M. Allodi, E. Siljehag, C. Wikman, T. Ford, and S. Bölte, "How I Feel About My School—Adaptation and Validation of an Educational Well-Being Measure among Young Children in Sweden," *International Journal of Environmental Research and Public Health*, vol. 18, no. 10, p. 5075, May 2021, doi: 10.3390/ijerph18105075.

[11] J. A. Campbell and I. M. Løkken, "Inside Out: A Scoping Review on Optimism, Growth Mindsets, and Positive Psychology for Child Well-Being in ECEC," *Education Sciences*, vol. 13, no. 1, p. 29, Dec. 2022, doi: 10.3390/educsci13010029.

[12] J. Lundqvist, M. W. Allodi, and E. Siljehag, "Values and Needs of Children with and Without Special Educational Needs in Early School Years: A Study of Young Children's Views on What Matters to Them," *Scandinavian Journal of Educational Research*, vol. 63, no. 6, pp. 951–967, Sep. 2019, doi: 10.1080/00313831.2018.1466360.

[13] J. Fane, C. MacDougall, J. Jovanovic, G. Redmond, and L. Gibbs, "Preschool Aged Children's Accounts of their Own Wellbeing: are Current Wellbeing Indicators Applicable to Young Children?" *Child Indicators Research*, vol. 13, no. 6, pp. 1893–1920, Dec. 2020, doi: 10.1007/s12187-020-09735-7.

[14] B. Nagima, N. Saniya, Y. Gulden, Z. Saule, S. Aisulu, and M. Nazigul, "Influence of special learning technology on the effectiveness of pedagogical ethics formation in future teachers," *Journal of Education and E-Learning Research*, vol. 10, no. 1, pp. 1–6, 2023, doi: 10.20448/jeelr.v10i1.4313.

[15] F. Åström, E. Björck-Åkesson, M. Sjöman, and M. Granlund, "Everyday environments and activities of children and teachers in Swedish preschools," *Early Child Development and Care*, vol. 192, no. 2, pp. 187–202, 2022, doi: 10.1080/03004430.2020.1754209.

[16] M. J. Briggs-Gowan, C. Greene, J. Ford, R. Clark, K. J. McCarthy, and A. S. Carter, "Adverse impact of multiple separations or loss of primary caregivers on young children," *European Journal of Psychotraumatology*, vol. 10, no. 1, p. 1646965, 2019, doi: 10.1080/20008198.2019.1646965.

[17] R. Huang, Z. Geng, and I. Siraj, "Exploring the Associations among Chinese Kindergartners between Academic Achievement and Behavioral, Cognitive and Emotional Self-Regulation," *Early Education and Development*, vol. 34, no. 3, pp. 591–606, 2023, doi: 10.1080/10409289.2022.2056695.

[18] K. M. Merki, A. Wullschleger, and B. Rechsteiner, "Adapting routines in schools when facing challenging situations: Extending previous theories on routines by considering theories on self-regulated and collectively regulated learning," *Journal of Educational Change*, vol. 24, no. 3, pp. 583–604, 2023, doi: 10.1007/s10833-022-09459-1.

[19] L. R. Zheng, C. M. Oberle, W. A. Hawkes-Robinson, and S. Daniau, "Serious Games as a Complementary Tool for Social Skill Development in Young People: A Systematic Review of the Literature," *Simulation and Gaming*, vol. 52, no. 6, pp. 686–714, 2021, doi: 10.1177/10468781211031283.

[20] K. M. Klopfer, K. Scott, J. Jenkins, and J. Ducharme, "Effect of Preservice Classroom Management Training on Attitudes and Skills for Teaching Children with Emotional and Behavioral Problems: A Randomized Control Trial," *Teacher Education and Special Education*, vol. 42, no. 1, pp. 49–66, 2019, doi: 10.1177/0888406417735877.

[21] R. Storli and E. B. H. Sandseter, "Children's play, well-being and involvement: how children play indoors and outdoors in Norwegian early childhood education and care institutions," *International Journal of Play*, vol. 8, no. 1, doi: 10.1080/21594937.2019.1580338.

[22] L. Martinez, M. Gimenes, and E. Lambert, "Video games and board games: Effects of playing practice on cognition," *PLoS ONE*, vol. 18, no. 3 p. e0283654, 2023, doi: 10.1371/journal.pone.0283654.

[23] M. S. Alotaibi, "Game-based learning in early childhood education: a systematic review and meta-analysis," *Frontiers in Psychology*, vol. 15, p. 1307881, 2024, doi: 10.3389/fpsyg.2024.1307881.
[24] J. Kim, J. Gilbert, Q. Yu, and C. Gale, "Measures Matter: A Meta-Analysis of the Effects of Educational Apps on Preschool to Grade 3 Children's Literacy and Math Skills," *AERA Open*, vol. 7, no. 1, pp. 1–19, 2021, doi: 10.1177/23328584211004183.
[25] N. Behnamnia, A. Kamsin, M. A. B. Ismail, and A. Hayati, "The effective components of creativity in digital game-based learning among young children: A case study," *Children and Youth Services Review*, vol. 116, p. 105227, 2020, doi: 10.1016/j.childyouth.2020.105227.
[26] Y. Baek and A. Touati, "Comparing Collaborative and Cooperative Gameplay for Academic and Gaming Achievements," *Journal of Educational Computing Research*, vol. 57, no. 8, pp. 2110–2140, 2020, doi: 10.1177/0735633118825385.
[27] P. Madanipour and C. Cohrssen, "Augmented reality as a form of digital technology in early childhood education," *Australasian Journal of Early Childhood*, vol. 45, no. 1, pp. 5–13, 2020, doi: 10.1177/1836939119885311.
[28] R. W. Chen and K. K. Chan, "Using Augmented Reality Flashcards to Learn Vocabulary in Early Childhood Education," *Journal of Educational Computing Research*, vol. 57, no. 7, pp. 1812–1831, 2019, doi: 10.1177/0735633119854028.
[29] D. Laranjeiro, "Development of game-based m-learning apps for preschoolers," *Education Sciences*, vol. 11, no. 5, p. 229, 2021, doi: 10.3390/educsci11050229.

BIOGRAPHIES OF AUTHORS

Gulnur Kilybayeva is a Ph.D. student at the Kazakh National Pedagogical University named after Abai. She currently works as a teacher at the East Kazakhstan University named after S. Amanzholov. Her scientific interests are adaptation of a child in a younger age group and its psychological and pedagogical aspects, game technologies. She can be contacted at email: eraly.balym@mail.ru.

Ulbossyn Kyyakbayeva works at Abai Kazakh National Pedagogical University from 1990 to the present. In 1990-2019, she passed the main official levels of the university: teacher, senior lecturer, associate professor, professor, from 2019 to the present. She is head of the Department of Preschool Education and Social Pedagogy. Her scientific interests are development of primary school teacher, preschool pedagogy, family pedagogy: education and training of preschool children. She can be contacted at email: kyakbaeva@mail.ru.

Raissa Izmagambetova successfully defended her Ph.D. thesis in the specialty Pedagogy and Methods of Primary Education at the Abai Kazakh National Pedagogical University in 2022. In 2023, she is a fellow of the postdoctoral program at the Abai Kazakh National Pedagogical University. Currently, she holds the position of head of the Department Scientometrics and Scientific Publications of the Abai Kazakh National Pedagogical University. Her scientific interests are primary school children self-esteem, integrating ChatGPT. She can be contacted at email: izmagambetova1988@mail.ru.

Gulmira Myshbayeva is affiliated with SDU University at Department of Humanities. She is the head of the educational program Pedagogy and Methods of Primary Education. In 2022, she defended her dissertation at the Abai Kazakh National Pedagogical University, majoring in preschool education and upbringing, and received a Ph.D. She has author's courses for university teachers, teachers of primary school and preschool organizations. She can be contacted at email: alkengul@mail.ru.

Roza Bekmagambetova is a doctor of pedagogical sciences and professor at the Department of Preschool Education and Social Pedagogy at Abai Kazakh National Pedagogical University. In 1990, she defended her candidate's dissertation. From 2009 to 2018, she was the head of the Department of Preschool Education and Social Pedagogy at Abai Kazakh National Pedagogical University. Her research interests cover preschool pedagogy, early childhood pedagogy, humane pedagogy, family pedagogy. She can be contacted at email: r.bekmagambetova@mail.ru.

Saniya Nurgaliyeva is a candidate in pedagogical sciences and a distinguished university professor at Abai Kazakh National Pedagogical University. Dr. Nurgaliyeva is currently participating in a visiting professor program at Ataturk University in Turkey. She is the winner of the republican competition of the Ministry of Education and Science among higher education institutions of the Republic Kazakhstan "The best teacher of higher education institution – 2017." Dr. Nurgaliyeva's research focuses on innovative processes in education and national upbringing, professional development models and their impact on student learning, as well as the implementation and effects of software environments in the classroom. Her work has been published in over 21 refereed journal articles, 3 books, and more than 100 additional publications. She has led and contributed to three research projects funded by the Ministry of Science and Higher Education. She can be contacted at email: sanianurgalieva77@gmail.com.