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# Early Childhood Education in the Digital Transformation Era: Opportunities, Challenges and Comprehensive Development Solutions for Vietnamese Children

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A B S T R A C T

Early childhood education for children aged 0-8 years is undergoing profound transformations in the context of the Fourth Industrial Revolution and global digitalization trends. This study employs a mixed-method approach, combining qualitative and quantitative research through document analysis, surveys of 173 participants, and in-depth interviews with 22 experts to assess the impact of digital transformation on early childhood education in Vietnam. Results reveal that artificial intelligence (AI), augmented/virtual reality (AR/VR), digital learning materials, and personalized learning platforms are creating unprecedented opportunities to enhance educational quality, develop comprehensive child competencies, and optimize teaching processes. However, implementation faces significant challenges regarding teacher capacity, technological infrastructure, financial resources, and child safety assurance. The study proposes the "Integrated Smart Early Education" (ISEE) model as a comprehensive solution, harmoniously combining traditional educational methods with modern technology. This model is built on four core pillars: developing digital competencies for teachers, implementing AI-based personalized learning, strengthening family-school collaboration through digital platforms, and building safe, secure learning environments. The study also provides specific policy recommendations for the Ministry of Education and Training, provincial education departments, and kindergarten institutions to effectively implement digital transformation during 2025-2030

## INTRODUCTION

Early childhood education, defined as the process of nurturing, caring for, and comprehensively developing children from birth to 8 years old, has been confirmed by modern educational science as a pivotal stage in human development. According to groundbreaking research by Nobel Prize-winning economist James Heckman (2006), investment in early childhood education yields the highest economic returns with rates up to 13% annually, far exceeding any other educational investment. This is reflected not only economically but also through profound impacts on brain development, cognitive abilities, social skills, and lifelong learning foundations (Shonkoff & Phillips, 2000).

Modern neuroscience research has proven that 90% of brain development occurs in the first 5 years of life, with over 1 million new neural connections formed every second during this period. This makes the early childhood education stage the "golden window of opportunity" for forming cognitive, emotional, and social foundations for children. In the context of Vietnam undergoing strong economic transformation, moving toward a knowledge economy and deep international integration, investing in developing high-quality early childhood education is not only an urgent need but also a decisive factor for national competitiveness in the future.

The Fourth Industrial Revolution with the explosion of digital technology, artificial intelligence, Internet of Things (IoT), and virtual reality is creating fundamental changes in all aspects of social life, with education being one of the most strongly impacted fields. Particularly, early childhood education is experiencing a quiet yet profound revolution with the emergence of advanced technologies such as artificial intelligence (AI), machine learning, augmented/virtual reality (AR/VR), interactive digital learning materials, and personalized learning platforms. These technologies not only open unprecedented opportunities for improving educational quality, optimizing teaching and learning processes, but also help develop comprehensive 21st-century skills for children from the earliest stages. According to UNESCO (2023) reports, educational technology is being deployed in over 184 countries worldwide, with varying levels of application and effectiveness depending on the economic-social conditions and educational policies of each country.

In Vietnam, the digital transformation process in education has been identified by the Party and State as one of the top priorities. According to the Ministry of Education and Training's 2024 report (MOET, 2024), the entire education sector has digitized nearly 24.57 million records of teachers, management staff, and students, with 83.2% of general education schools implementing management software in operations. Two important public services, "Registration for high school graduation examination" and "Recognition of bachelor's, master's, doctoral degrees and equivalent qualifications issued by foreign educational institutions," have been successfully deployed on the online public service portal with over 1.03 million processed records. However, technology application in kindergarten education still has many limitations and lacks specific, comprehensive guidelines on standards and implementation processes. Preliminary survey results show that only 16.3% of kindergartens are

currently piloting AI tools in teaching, and 34.7% of kindergarten teachers have been trained in information technology applications (Nguyen & Le, 2024).

The overall objective of this research is to provide a comprehensive, objective view of the impact of digital transformation on early childhood education in Vietnam, thereby proposing effective development models and solutions suitable to actual conditions and development trends of the country. The research focuses on four specific main objectives: overview of theories and practices of early childhood education in Vietnam and countries worldwide in the context of digital transformation; in-depth analysis of the impact of technology and digital transformation on early childhood education; proposing effective technology-integrated early childhood education models; and providing policy recommendations and practical solutions to improve early childhood education quality through training and developing teacher teams, strengthening cooperation between families and schools, applying technology appropriately and safely.

## LITERATURE REVIEW

Early childhood education has solid theoretical foundations built from decades of scientific research. According to Jean Piaget's cognitive development theory, children go through qualitatively different developmental stages, where the period from 0-7 years is the time of forming basic cognitive structures. Vygotsky's Zone of Proximal Development theory emphasizes the importance of social interaction and adult support in children's learning processes (Siraj-Blatchford et al., 2022). Modern neuroscience research has further strengthened the importance of early childhood education. Neuroplasticity studies show that children's brains have exceptionally high adaptability and learning capacity in the early years, creating "critical windows of opportunity" for developing language, cognitive, social, and emotional skills.

Globally, integrating technology into early childhood education is becoming a powerful trend with three main directions shaping the future of digital early childhood education. The first trend is learning personalization through artificial intelligence, with modern AI systems capable of analyzing each child's learning data to provide recommendations suitable for learning pace, preferences, and individual needs. The second trend is using virtual and augmented reality to create vivid and interactive learning experiences, allowing children to "travel" to historical sites, explore distant planets, or observe cellular activities in virtual laboratories. The third trend is developing online collaborative learning platforms, allowing children from different locations to participate together in common projects, share knowledge, and learn from each other.

Finland, the country rated as having the world's most excellent education system, has systematically implemented the "Digital Competence in Early Childhood Education" program since 2020, focusing on massive investment in training and developing digital competencies for teacher teams. Evaluation results show that 94.7% of kindergarten teachers in Finland now master the necessary skills to effectively and creatively integrate technology into teaching

processes (Finnish National Agency for Education, 2023). Singapore has developed the "PlayMaker" platform - a system using artificial intelligence to personalize the learning process for children aged 3-6, with results showing that learning effectiveness of children using this platform increased by 37.8% compared to traditional teaching methods (Ministry of Education Singapore, 2023).

Recent studies have shown that using technology in early childhood education can bring many benefits if implemented in a controlled manner appropriate to age groups. Research by Chen & Zhao (2023) on AI applications in kindergarten education shows that children using smart educational applications have 23.4% higher concentration ability and 18.7% improved problem-solving skills compared to groups not using technology. However, research also points out concerns about negative impacts of excessive screen exposure. The World Health Organization (WHO) has recommended that children under 2 years should not be exposed to screens, and children aged 2-5 should not use more than 1 hour per day (Radesky et al., 2020). This poses a major challenge for designing technology-integrated educational programs that must find ways to use effectively while still ensuring safety for children's development.

## METHODOLOGY

This research is designed according to a mixed-method approach, harmoniously combining qualitative and quantitative research to ensure comprehensive, objective, and highly reliable results. The research methodology is built on three main pillars: literature research and secondary data analysis, large-scale quantitative surveys, and qualitative research through in-depth interviews (Creswell & Plano Clark, 2017). This research design allows us not only to collect quantitative data with high representativeness about the current state of technology application in early childhood education, but also to deeply analyze qualitative factors, practical experiences, and professional perspectives of stakeholders.

The literature research phase was conducted systematically and comprehensively, including synthesis and analysis of domestic and international scientific studies on early childhood education, digital transformation in education, and technology application in kindergarten education. We collected and analyzed over 147 documents from authoritative sources such as UNESCO, OECD, leading international journals in education and technology, as well as official reports from Vietnam's Ministry of Education and Training and regional countries. The document analysis process was conducted through steps: determining document selection criteria based on reliability, relevance, and timeliness; classifying documents by topic and origin; content analysis using thematic analysis methods; and synthesizing and comparing research results to identify general trends. The secondary data analysis process focused on using official statistics from the Ministry of Education and Training's database system, including data on digital transformation implementation status in education, quantity and quality of kindergarten teacher teams, technological infrastructure investment status at kindergarten educational institutions.

The quantitative survey phase was designed with a scale of 173 subjects, including 103 parents with children studying at kindergarten educational institutions, 48 teachers and kindergarten education management staff, and 22 experts in education and technology fields. Sample selection was performed using stratified sampling methods, ensuring representation across different regions of the country with sample structure including Northern region 58 subjects (Hanoi: 32, Hai Phong: 26), Central region 57 subjects (Da Nang: 31, Hue: 26), and Southern region 58 subjects (Ho Chi Minh City: 33, Can Tho: 25) (Cohen et al., 2018). The main data collection tool was a structured questionnaire, built based on international standardized scales and adjusted to suit Vietnam's context to collect information about perceptions of educational technology, current status of technology use, challenges and barriers, training and support needs, as well as expectations and suggestions.

The qualitative research phase was conducted through 22 in-depth interviews with leading experts in kindergarten education, educational technology, and digital transformation, including 8 researchers from educational research institutes, 6 lecturers from pedagogical universities, 4 experts from MOET and provincial education departments, and 4 experts from leading educational technology companies. In-depth interviews were conducted using semi-structured methods, allowing experts to freely and deeply share professional perspectives, practical experiences, and specific proposals (Braun & Clarke, 2019). Quantitative data was processed and analyzed using SPSS 25.0 software, using descriptive statistical methods and inferential statistics. Qualitative data was analyzed using thematic content analysis methods, helping identify main themes and relationships between different factors.

## RESULT AND DISCUSSION

Research results show that regarding technological infrastructure, although all 63 provinces have digital transformation plans in education, only 81.4% of kindergartens have stable internet connections, 43.6% have interactive display equipment, and only 14.8% of schools have educational robots and AI application devices (Vu & Hoang, 2024). This disparity is particularly evident between regions, with Hanoi having 95.3% of schools with stable internet and 67.8% with interactive equipment, while other provinces in the North only have 76.9% and 34.2% respectively. Similarly, Ho Chi Minh City leads with 96.8% of schools having stable internet and 72.1% having interactive equipment, significantly higher than other southern provinces with 78.6% and 37.8%. Regarding teacher team capacity, although 76.9% of kindergarten teachers have basic computer skills, only 31.2% have received specialized training in educational technology application, and only 7.3% of teachers know how to use AI tools to support teaching (Dao et al., 2024). Detailed analysis shows 84.3% of teachers can use internet and email, 62.7% can create simple digital documents, but only 18.5% can create interactive digital content and 9.7% can use AR/VR devices.

Regarding family participation, surveys show 68.4% of parents support using technology in their children's education (with 23.7% strongly supporting

and 44.7% supporting), but only 22.7% of families invest in home learning support devices, and 44.3% of parents still worry about negative impacts of screen use on children's health and development (Pham & Nguyen, 2024). Parents' main concerns include eye safety and health (44.3%), reduced social interaction (37.6%), investment costs (31.9%), lack of content control (28.4%), and concerns about replacing traditional activities (24.7%).

The digital technology revolution is opening unprecedented opportunities to revolutionize early childhood education, creating entirely new, effective teaching and learning methods suitable for 21st-century child development characteristics (Chen & Zhao, 2023). Artificial Intelligence (AI) is leading this revolution with unprecedented personalization capabilities. Modern AI systems can analyze children's learning characteristics in detail and accurately, including knowledge absorption speed, preferred learning styles, personal interests, strengths, and difficulties requiring support. Voice and language recognition systems can assess pronunciation ability with 94.7% accuracy, analyze vocabulary and language structure, provide personalized language skill improvement exercises, and support children with language difficulties or multilingual backgrounds. Simultaneously, adaptive educational content creation systems can create educational games suitable for age and preferences, produce personalized interactive stories, adjust exercise difficulty in real-time, and suggest art activities appropriate to children's abilities.

Virtual and Augmented Reality (VR/AR) technology is providing completely new learning experiences, helping children explore the world safely and vividly (Akçayır & Akçayır, 2017). Through VR, children can "travel" to famous landmarks worldwide, explore deep oceans, fly into vast space, or return to the past to learn about national history and culture without leaving the classroom. Specific applications include exploring history and culture such as "traveling" to Vietnamese historical sites (Temple of Literature, Hoi An Ancient Town), visiting famous world museums, experiencing traditional festivals, and interacting with historical figures. In natural science exploration, technology allows observing molecular and atomic structures, following life cycles of flora and fauna, exploring the solar system and planets, learning about the human body and organ systems.

Digital multimedia learning materials are revolutionizing children's approach to knowledge (Radesky et al., 2020). Unlike traditional textbooks with only text and static images, digital materials can integrate high-quality audio, vivid videos, 3D animations, and interactive games, creating rich multi-sensory learning experiences. High interactivity allows children to touch, drag, drop, and interact with content, provides immediate feedback to children's actions, encourages active participation instead of passive reception, and enhances concentration and memory. Flexible updating capability helps content be updated regularly and timely, information always fresh and accurate, can be adjusted according to each locality and cultural context, and easily add new features.

Alongside tremendous opportunities, implementing digital transformation in early childhood education also faces many significant

challenges and barriers that need comprehensive and systematic solutions. The greatest and most fundamental challenge concerns human resources, especially kindergarten teachers' capacity to apply technology in teaching (Dao et al., 2024). This is not only due to lack of technical knowledge but also lack of understanding about how to harmoniously combine technology with traditional pedagogical methods. Current training courses are spontaneous, lacking connection, training quality uneven between localities, lacking consistency in applying learned knowledge, and no standardized standards for educational technology competencies. Simultaneously, generational gaps create situations where older teachers face difficulties accessing new technology, lack confidence using modern devices and applications, worry about being replaced by technology, and need long time to change familiar teaching methods.

Infrastructure and financial challenges are another major barrier in digital transformation implementation. Economic-social condition disparities between regions create significant inequalities in technology access (Vu & Hoang, 2024). Initial investment costs for a kindergarten with 200 children are estimated to include basic infrastructure such as high-speed internet systems (25-40 million VND), computer and tablet equipment (150-200 million VND), smart interactive screens (80-120 million VND), audio and lighting systems (30-50 million VND), along with software and content costs such as educational software licenses (20-35 million VND/year), digital content and applications (15-25 million VND/year), system maintenance and updates (10-20 million VND/year).

Safety and information security issues are particularly important challenges when working with children. Collecting, storing, and using children's data raises many complex issues about privacy, information security, and ethics (Radesky et al., 2020). Main concerns about personal data protection include collecting children's learning and development information, protecting children's images and videos, preventing unauthorized data access, and ensuring data deletion rights when parents request. Simultaneously, content safety must be ensured through strict censorship of educational applications and content, preventing access to inappropriate content, ensuring accuracy and cultural appropriateness, and controlling advertising and commercial content.

Based on extensive research results on current status, opportunities, and challenges of technology application in early childhood education, we propose the "Integrated Smart Early Education" (ISEE) model as a comprehensive solution suitable for Vietnam's context. The ISEE model is built on educational philosophy that places children at the center, harmoniously combining good values of traditional educational methods with modern technology power. Core design principles include: child-centered approach where all technology decisions must stem from children's interests and needs, respecting natural development pace, ensuring personalization, and protecting children's privacy and safety; harmonious integration through combining technology with traditional activities, not completely replacing proven educational methods, creating balance between digital and non-digital activities, and ensuring comprehensive child development; sustainable development by building long-term capacity for

teacher teams, investing in sustainable infrastructure, creating replicable models, and ensuring economic feasibility.

The ISEE model is designed as an integrated educational ecosystem with four core pillars that interact and support each other. The first pillar is "Tech-enabled Teachers" focusing on developing comprehensive digital competencies for kindergarten teacher teams with a three-level progressive training program: basic level (40 hours) on basic office computer skills, safe internet and email use, simple document creation and presentation, basic network security knowledge; intermediate level (60 hours) on using specialized educational software, designing interactive lessons, managing digital classrooms, evaluating and monitoring learning progress; advanced level (80 hours) on AI applications in education, using VR/AR technology, developing creative digital content, research and educational innovation.

The second pillar is "Personalized Learning" leveraging artificial intelligence power to create individually designed learning experiences for each child with main components including adaptive assessment systems to evaluate children's initial abilities, monitor learning progress in real-time, identify strengths and difficulties, provide learning method recommendations; and flexible learning content with ability to adjust difficulty appropriate to abilities, provide multiple approaches to knowledge, create activities suitable for preferences, ensure diversity and attractiveness.

The third pillar is "Family-School Partnership" recognizing that success in early childhood education requires close coordination between families and schools. Digital connection platforms include mobile applications for parents to track children's daily activities at school, receive learning progress notifications, communicate directly with teachers, access home learning support resources; and automatic reporting systems with periodic development progress reports, early warnings about issues needing attention, suggesting appropriate family activities, sharing achievements and important milestones. The fourth pillar is "Safe Learning Environment" considered a prerequisite and indispensable element in any educational program using technology for children. Technical safety standards include controlling screen time by age (children 2-3 years maximum 15 minutes/day, children 3-4 years maximum 30 minutes/day, children 4-5 years maximum 45 minutes/day, children 5-6 years maximum 60 minutes/day), and ensuring equipment quality with screens having appropriate brightness (not exceeding 250 nits), minimum viewing distance 50cm, equipment meeting international safety standards, regular maintenance and inspection.

**Policy Recommendations and Practical Solutions**

To successfully implement the Integrated Smart Early Education (ISEE) model and promote digital transformation in kindergarten education in Vietnam, close and comprehensive coordination is needed from many different levels, from building legal frameworks at the national level to specific implementation at each educational institution. At the Ministry of Education and Training level, the top priority is building and perfecting comprehensive legal frameworks for technology application in kindergarten education. Regulations on technology application in kindergarten education need to be issued with detailed content on

equipment and software standards ensuring absolute safety for children (physical and content), strict censorship of educational applications, regulations on usage time appropriate for each age group, standardization of interfaces and user experiences; along with evaluation and approval processes through establishing multidisciplinary expert councils, building comprehensive evaluation criteria, trial and effectiveness evaluation processes, monitoring and periodic review mechanisms.

The digital competency framework for kindergarten teachers, expected to be issued in 2025, needs to be built as a national standardization system with structure including basic competencies (Level 1) on using basic technology devices, searching and evaluating information, online communication and collaboration, understanding safety and security; application competencies (Level 2) on integrating technology into teaching, designing digital learning activities, evaluating and monitoring learning progress, using data to improve teaching; and innovation competencies (Level 3) on developing digital educational content, applying AI and advanced technology, researching and evaluating effectiveness, guiding and sharing experiences.

Regarding infrastructure and equipment investment, the "Digital Kindergarten" program needs to be designed as a large-scale national program with long-term vision. With an estimated budget of 4.750 trillion VND for the 2025-2030 period, the program is allocated in three phases: Phase 1 (2025-2026) with 1.425 trillion VND to pilot implementation at 950 schools (30% of total), train 2,850 seed teachers, develop indigenous digital content; Phase 2 (2027-2028) with 1.900 trillion VND to expand to 1,583 additional schools (50% of total), train 4,749 teachers, build centralized management systems; and Phase 3 (2029-2030) with 1.425 trillion VND to complete all 3,166 kindergartens, train all remaining 9,498 teachers, evaluate and perfect the system. At the local level, implementation needs to be carried out according to a specific and scientific roadmap with three clear phases. The pilot phase (2025-2026) focuses on selecting 8-12% of kindergartens for pilot implementation, concentrating on schools with the best conditions, training "seed" teacher teams, building standard models that can be replicated. The expansion phase (2026-2028) implements for 48-52% of kindergartens, based on experience from the pilot phase, strengthening experience sharing between schools, perfecting processes and standards. The completion phase (2028-2030) implements comprehensively for all kindergartens, evaluates overall effectiveness, adjusts policies appropriately, prepares for the next development phase. Public-private partnership (PPP) mechanisms need to be designed in a balanced manner with main cooperation forms including infrastructure investment cooperation (enterprises invest equipment, government rents services, shares investment and operation costs, long-term commitment to service quality, technology and experience transfer) and content development cooperation (enterprises develop educational content, government purchases usage rights, ensures appropriateness with Vietnamese culture, regular content updates and maintenance).

At the kindergarten level, building specific digital transformation plans for each educational institution is necessary with current status evaluation

processes including teacher capacity assessment (surveying current computer skills, evaluating attitudes toward technology, identifying specific training needs, developing personal development plans), technology infrastructure assessment (checking current equipment status, evaluating internet connection quality, identifying upgrade needs, developing step-by-step investment plans), and analyzing needs and expectations (surveying parent opinions, understanding children's needs, analyzing community conditions, determining appropriate goals). Teacher team training and development programs at each school need to be designed as a lifelong learning process with regular training activities such as monthly workshops to share technology application experiences, practice with new tools, discuss encountered challenges, build learning communities; and mentor systems to pair experienced teachers with new teachers, support and share practical knowledge, create positive learning environments, encourage innovation and creativity.

## CONCLUSIONS AND RECOMMENDATIONS

This research has provided a comprehensive and in-depth view of the impact of digital transformation on early childhood education in Vietnam, thereby affirming that technology is not only a support tool but also a factor that can create fundamental changes in how we approach and implement education for children (Tran & Pham, 2023). Research results have clearly shown that technologies such as artificial intelligence (AI), augmented/virtual reality (AR/VR), interactive digital learning materials, and personalized learning platforms are opening unprecedented opportunities for improving education quality, optimizing learning processes, and comprehensively developing necessary skills for children in the 21st century. Simultaneously, the research has also identified and analyzed in detail significant challenges and barriers in the implementation process, from lack of teacher team capacity, technological infrastructure limitations, to concerns about children's information safety and security.

The "Integrated Smart Early Education" (ISEE) model proposed in this research is not just a technical solution but also a new educational philosophy, placing children at the center and viewing technology as a means to enhance, not replace, core values of traditional education (Chen & Zhao, 2023). The four pillars of this model - Tech-enabled Teachers, Personalized Learning, Family-School Partnership, and Safe Learning Environment - are designed to operate as an integrated ecosystem, where each element plays an important role and interacts closely with other elements. From a scientific contribution perspective, this research has clarified concepts about early childhood education in digital environments, built theoretical frameworks integrating traditional educational methods with modern technology harmoniously and effectively. From a practical perspective, the research has proposed a specific and feasible model that can be applied in Vietnam's actual conditions (Le et al., 2024). The proposed policy recommendations not only have high feasibility but are also designed with flexibility, allowing adjustments according to specific conditions of each locality and educational institution.

However, this research also has certain limitations that need to be acknowledged and overcome in subsequent studies. Due to time and resource constraints, the research survey scope is not yet broad enough to fully represent the nationwide situation. With 173 survey subjects distributed across 6 provinces and cities, although selected representatively, it still cannot fully reflect the diversity of economic-social conditions of all 63 provinces and cities nationwide. Due to the relatively new nature of technology application in kindergarten education, there is insufficient long-term data to evaluate the real impact of technology on children's development. Current research mainly relies on short-term evaluations and subjective opinions of stakeholders, unable to track long-term impacts on children's cognitive, emotional, social, and physical development indicators. Although the research has referenced many international experiences from countries like Finland, Singapore, South Korea, the lack of direct comparative data with ASEAN countries limits the ability to assess Vietnam's position in the regional context.

Based on current research results and limitations, we propose future research directions to continue perfecting and developing early childhood education in the digital age. Long-term research on technology's impact on children's development is the top priority with research design including 500 children aged 3-6, divided into experimental and control groups, tracked for 5 years (2025-2030), evaluating cognitive, language, motor, social-emotional development indicators every 6 months using standardized tools at 15 provinces representing different regions. International comparative research also needs priority with comparison frameworks for ASEAN countries (Singapore, Malaysia, Thailand, Philippines), developed Asian countries (South Korea, Japan, Taiwan), and Western countries (Finland, Denmark, Canada, Australia) according to criteria on policies and legal frameworks, investment levels for digital early childhood education, teacher training quality, implementation model effectiveness, children's learning and development results.

In-depth research on developing digital competency assessment tools for kindergarten children with content developing kindergarten children's digital competency scales (basic digital cognition for 3-4 year olds, technology device interaction for 4-5 year olds, educational application use for 5-6 year olds, logical thinking and digital problem-solving for 6+ year olds) and digital behavior observation tools (daily behavior tracking checklists, participation level assessment rubrics, progress recording sheets over time, parent reporting systems). Research on family roles in digital education with priority topics on parent training methods (designing digital skill learning programs for parents, building online support systems, creating experience sharing communities, evaluating intervention effectiveness) and home digital learning environments (principles for establishing learning spaces, selecting appropriate devices and applications, managing technology usage time, balancing digital and non-digital activities). Research on ethics and philosophy of education in the digital age also needs attention with ethical issues on privacy and data protection (building legal frameworks protecting children, principles for data collection and use, parental rights in information control, monitoring and compliance checking mechanisms)

and equity in education access (minimizing digital gaps between regions, ensuring equal opportunities for all children, supporting vulnerable groups, developing low-cost technology solutions).

This research has laid important foundations for developing early childhood education in the digital transformation era in Vietnam. The proposed ISEE model is not just a technical solution but also a vision for education's future, where technology and humans cooperate to create the best learning experiences for children. Success of this model will require long-term commitment from all stakeholders, from resource investment to changing mindsets and educational methods. The main message from this research is that digital transformation in early childhood education is not about completely replacing traditional methods with technology, but an integration process to create a new educational ecosystem - more effective, more personalized, and more suitable for 21st-century children's development needs. To succeed in this transformation, comprehensive investment is needed in technological infrastructure, human resource development, building quality educational content, and especially ensuring safety and security for children. We call on all stakeholders to work together to realize the vision of a modern, high-quality early childhood education system for Vietnamese children. Successful implementation of the ISEE model will position Vietnam as a regional leader in digital early childhood education, creating a future generation of citizens capable of succeeding in the global knowledge economy.

## FURTHER STUDY

This research still has limitations so further research is needed related to the topic of Early Childhood Education in the Digital Transformation Era: Opportunities, Challenges and Comprehensive Development Solutions for Vietnamese Children to perfect this research and increase insight for readers.

## REFERENCES

Akçayır, M., & Akçayır, G. (2017). Advantages and challenges associated with augmented reality for education: A systematic review of the literature. Educational Research Review, 20, 1-11. https://doi.org/10.1016/j.edurev.2016.11.002

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. Qualitative Research in Sport, Exercise and Health, 11(4), 589-597. https://doi.org/10.1080/2159676X.2019.1628806

Chen, L., & Zhao, P. (2023). Artificial intelligence in early childhood education: Current applications and future directions. Computers & Education, 195, 104-118. https://doi.org/10.1016/j.compedu.2023.104712

Cohen, L., Manion, L., & Morrison, K. (2018). Research methods in education (8th ed.). Routledge.

Creswell, J. W., & Plano Clark, V. L. (2017). Designing and conducting mixed methods research (3rd ed.). SAGE Publications.

Dao, M. H., Le, T. N., & Vu, H. S. (2024). Digital competency development among Vietnamese kindergarten teachers: Current status and challenges. Vietnam Journal of Educational Sciences, 18(2), 45-62.