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IMPACT OF TECHNOLOGY GAME-BASED LEARNING IN SOCIO-EMOTIONAL DOMAIN OF KINDERGARTEN LEARNERS

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ABSTRACT

The incorporation of digital resources into early childhood education has become increasingly common in the present day of swift technical progress. This study examines the educational effects of technology game-based learning (TGBL) on the social and academic growth of kindergarten pupils. It emphasizes the significance of early childhood as a critical phase for cognitive, emotional, and psychological development, especially in a modern era where children are progressively immersed in digital contexts. This research, rooted in developmental theories and reinforced by current studies, examines the impact of TGBL on critical developmental domains like problem-solving, communication, teamwork, motor abilities, and emotional regulation. The research used a Descriptive Quantitative methodology, collecting data from kindergarten teachers with varied demographic backgrounds to evaluate their perceptions, obstacles, and experiences in the implementation of TGBL. Research indicates that although educators acknowledge the advantages of TGBL in improving engagement, cognitive flexibility, and social interaction, they encounter considerable obstacles, such as insufficient training, classroom management difficulties, and accessibility limitations. Teachers' evaluations of the effectiveness of TGBL differ according to criteria such as age, experience, and educational qualifications, underscoring the necessity for customized assistance and professional development. A comprehensive program is presented to address the deficiencies in digital competency and diversity, incorporating regional boot camps, mentorship efforts, and ongoing training opportunities. The study finds that effective and equitable integration of TGBL into the kindergarten curriculum necessitates ongoing investment, policy support, and adaptive learning methodologies. This research provides significant insights into the establishment of inclusive, engaging, and developmentally suitable learning settings that equip young learners for the challenges of 21st-century education.

KEY WORDS: *Technology Game-Based Learning (TGBL), Kindergarten education, Digital Learning Tools, Cognitive development, Social and emotional learning.*

I. INTRODUCTION

The rapid advancement of digital technology has significantly impacted children's lives, raising concerns about its effects on their emotional and psychological development. Early childhood, particularly during kindergarten, is foundational for cognitive, social, and emotional development, influencing children's attitudes toward education and learning (Republic Act No. 10157 s. 2012).

Kindergarten serves as the initial phase of formal education, where educators and parents work together to foster curiosity and essential skills. The integration of technology, particularly through game-based learning, offers innovative methods to engage young learners, enhancing their problem-solving and critical thinking abilities while catering to diverse learning styles. This approach not only makes learning enjoyable but also prepares children for future academic challenges by cultivating digital literacy and adaptability. However, further research is needed to explore the social-emotional benefits of technology-based learning and to better understand the perspectives of educators, parents, and students regarding its implementation in the curriculum

The study is based on J. P. Gee's Game-Based Learning Theory, which identifies 16 key elements that enhance learning through video games. These elements include players developing a sense of identity, engaging in narrative through interactions, and experiencing low-stakes failure, which encourages risk-taking. Games allow for customization, enabling players to engage at their skill level and exert control over their environment. They present interconnected challenges that promote mastery and critical thinking, while also fostering language acquisition through gameplay. The balance of challenge and accessibility is crucial for maintaining player engagement. Additionally, games encourage broader situational awareness and collaborative skills in multiplayer settings, reversing traditional learning models by allowing action before learning. With the rise of digital technology, game-based learning (GBL) offers a more engaging educational experience compared to conventional methods, leading to improved learning outcomes (Ong et al., 2021). This study aims to evaluate the educational effects of technology-based game-learning activities on

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kindergarten students' social and academic growth, as well as the challenges teachers face in implementing effective learning alternatives.

The study aimed to evaluate the effects of technology-enhanced game-based learning on the socio-emotional competencies of kindergarten students at Tesaban Wat Maheyong School in Thailand during the 2024-2025 academic year. Utilizing a descriptive-quantitative research methodology, the researcher employed a questionnaire checklist to gather data on cognitive skill development, learning engagement, social interaction, and inclusivity related to these learning activities. Additionally, the study collected supplementary data regarding challenges in integrating technology into game-based learning, focusing on aspects such as adaptation, customization, teacher training, and accessibility.

The experiences and perspectives of kindergarten teachers, parents, and students about implementing and participating in game-based learning activities are inadequately reflected in the existing study literature. Their observations provide valuable insights into the challenges, facilitators, and overall perceptions regarding incorporating game-based learning into the kindergarten curriculum. The identified gaps direct the researcher to formulate the problem about the educational influence of technology-based game learning on the social and academic development of kindergarten learners.

1.1 Statement of the Problem

1. What is the demographic profile of the respondents in terms of age, sex, position title, number of years in a teaching position, and highest educational attainment?
2. What is the composite mean on the challenges of incorporating technology game-based learning activities in the kindergarten level based on the respondents' perspective with respect to Adaptability, Customization, Teacher Training, Accessibility?
3. What is the composite mean on the educational impact of technology game-based learning activities on kindergarten learners' social and academic development in terms of Cognitive Skills Development, Learning Engagement, Social Interaction, and Inclusivity?
4. Is there a significant difference in the assessment of the respondents on the educational impact of technology game-based learning activities on kindergarten learners and their profile?

2. REVIEW OF RELATED LITERATURE

Aldhafeeri and Khan (2022) indicates that educators aged 30-40 demonstrate superior digital proficiency and a greater inclination to adopt instructional technologies in early childhood classrooms compared to their older counterparts. This generational pattern indicates that age influences the confidence and frequency of technology integration in educational practices, particularly in game-based learning environments.

Ding and He (2021) corroborates the finding, demonstrating that both male and female early childhood educators display comparable attitudes and competencies in employing digital tools for socio-emotional learning. It underscores that the effective integration of TGBL is primarily influenced by training and institutional support rather than gender differences.

Turan and Meral (2022), which indicated that early-career educators were more predisposed to utilize and positively evaluate the effectiveness of digital games in promoting students' socio-emotional and cognitive growth, ascribed to their technological adeptness and superior training backgrounds.

Chauhan and Dahiya (2021) demonstrates that educators with higher academic degrees tend to hold positive attitudes toward educational technology and show more competence in its implementation in classroom settings. Research reveals that educators with postgraduate training demonstrate more confidence in utilizing technology to improve students' emotional and social abilities, particularly when used through interactive methods like game-based learning.

According to Manesis (2020), factor analysis identifies three challenges to the implementation of games-based learning in early childhood classrooms: insufficient confidence, inadequate support, and lack of equipment. As teachers' self-efficacy in utilizing digital games increases, their impression of the barrier of insufficient confidence diminishes. Educators who infrequently utilize computers and digital games in the classroom regard a deficiency of confidence as a significant obstacle. Teachers in public preschools exhibit markedly higher favorable sentiments regarding the efficacy of Game-Based Learning compared to their counterparts in private preschools.

According to Avdiu (2020), contemporary research indicates ongoing transformations in educational practices, with game-based learning recognized as one of the most successful methods for acquiring new knowledge over the years. This research aimed to comprehend the pedagogical methods employed in game-based learning and their significance in elementary education. The study's findings and the researcher's observations indicate that game-based learning is a prevalent pedagogical approach in Austrian primary schools, creating an enjoyable and effective atmosphere for students. The findings of this study demonstrate the methodologies

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employed by educators across several areas and highlight the diverse abilities and competencies that youngsters cultivate through play. Educators assert that game-based learning poses continual problems in identifying and creating varied game activities while tailoring instruction to meet the requirements and interests of students.

Alimisis's (2021) research, which claims that the effective integration of game-based learning in early education requires educators to have access to appropriate technologies and to possess the pedagogical and technical skills necessary to tailor these tools to meet diverse learner needs. His research underscores that training, accessibility, and adaptability are three fundamental pillars that must be regarded for digital tools to promote holistic learning outcomes in young children.

The study by Behnamnia et al. (2020) indicates that DGBL may influence students' development of creative skills, critical thinking, knowledge transfer, digital skill acquisition, and a favorable attitude toward learning while also facilitating profound and insightful learning. The pupils encountered opportunities to engage in the creative thinking process while comprehending issues and learning through instructional digital games.

According to the research conducted by Lamrani and Abdelwahed (2020), early childhood education has emerged as a significant public policy concern that profoundly influences a child's personality, upbringing, education, socialization, development, and academic achievement from preschool through university and beyond. Traditional teaching approaches typically employ a rigid learning framework that inhibits a child's motivation, creativity, and innovation. Students receive theoretical education instead of practical training, which hinders their ability to retain and recall concepts and information efficiently. Furthermore, conventional pedagogy often fails to capture the complete attention of students, resulting in diminished interaction, engagement, and commitment to the material. Consequently, the advancement of novel methodologies providing superior schooling is an efficacious means to tackle this issue. Conversely, new studies in cognitive science and educational neuroscience indicate that play-based learning is a potential method for early childhood education. Four essential success criteria for learning have been discovered to enhance children's skills: attention, active engagement, feedback, and consolidation. The proposed method introduces a digital play-based learning strategy utilizing serious games to enhance the pedagogical elements of the Montessori approach, aimed at improving children's skills throughout early education through play and gamification. It seeks to provide youngsters with a diverse array of engaging gaming activities and stimulating experiences within an interactive setting.

Papadakis et al. (2021), which demonstrates that digital game-based learning significantly improves engagement, collaboration, and cognitive skill development in early childhood settings. Their research indicated that well-designed TGBL platforms tailored for young learners positively impact both academic and socio-emotional development by providing dynamic, meaningful, and enjoyable learning experiences.

Laranjeiro (2021) asserts that current research identifies tablets as the favored gadgets among preschool children, attributed to their portability, user liberty, and diverse applications. There is substantial data about the impact of digital technologies across various domains of learning at these ages. The Aprender XXI project sought to create game-based learning applications aligned with the Curriculum Guidelines for Preschool Education (CGPE). The project employed a Design-Based Research (DBR) methodology, integrating scientific inquiry with technical advancement. The project was segmented into three phases: preliminary study (literature review, exploration of existing applications, examination of preschool curriculum), development (specifications, scriptwriting, design, and programming), and assessment (user testing and conclusions). The initial investigation recognized the necessity to delineate robust applications. The assessment, including children and educators, confirmed the development and identified enhancements in the applications. The project produced four thematic applications—environment, health, citizenship, and professions—comprising a collection of games suited for independent usage by children or educator-led instructional activities in kindergarten. A website gathers children's play data, depicted as flowers in a virtual environment, to demonstrate their engagement and collaboration for an improved future.

Ilgaz et al. (2020) assert that play is an inherent strength of childhood, enabling children to develop and refine essential language, cognitive, and socio-cognitive skills. This enduring concept has significantly influenced early childhood curricula, mostly by allocating time and space for unstructured play. Recently, the efficacy of play in early childhood development and its subsequent role in the early childhood curriculum has come under scrutiny, particularly in the USA. Policymakers are replacing playtime with instructional methods focused on teaching decoding skills that address a limited range of literacy and school-ready competencies. Their choice to transform the early childhood classroom into a more didactic, adult-directed teaching environment is corroborated by recent assessments of play research indicating modest or inconsistent impacts. The necessity for extensive playful learning programs that enhance free play and instructional methods is examined, highlighting the importance of disseminating playful learning strategies to educators, hence facilitating the integration of curricular objectives into playful learning activities.

Zainuddin et al. (2020), which emphasized that the demographic attributes of educators, particularly their age and teaching experience, significantly influence their adoption and effective implementation of digital game-based learning in classrooms. The

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study underscores the importance of personalized training programs to ensure that all educators, irrespective of their backgrounds, are equipped with the essential skills and motivated to use Teaching, Learning, and Learning strategies effectively.

II. RESEARCH METHODOLOGY

Research Design

The research utilized a descriptive survey design to investigate the educational effects of technology-enhanced game-based learning on kindergarten academic development. This design effectively combines descriptive and survey methodologies to provide a comprehensive overview of the phenomenon through systematic data collection and analysis. The primary goal was to describe the current state of affairs and ascertain the prevalence of specific features within the surveyed population. The study employed a questionnaire checklist as the main research instrument, enabling a structured examination of the impacts on academic growth by gathering quantitative data on participants' opinions and experiences (Pawar, 2020).

Population and Sampling

Tesaban Wat Maheyong School in Thailand consisted of fifty (50) educators. The researcher employed purposive sampling to provide opportunities to the school responders. The participants were selected purposefully, as the researcher deemed them the most appropriate for the study, having experienced the management processes enacted in the school and observed their effects on teachers' performance and parental engagement.

Respondents of the Study

The respondents of the study consisted of fifty (50) kindergarten teachers from Tesaban Wat Maheyong School in Thailand. The samples were selected through the cluster sampling technique.

Statistical Treatment

The study utilized frequency and percentage distributions to analyze the demographic profile of respondents and to identify limitations in technology game-based learning for kindergarten learners, focusing on adaptation, customization, teacher training, and accessibility. Additionally, a weighted mean was used to evaluate the impact of technology-based game-learning activities on various aspects of academic development, including cognitive capabilities, learning engagement, social interaction, and inclusivity. To determine if there was a significant difference in respondents' evaluations of the educational impact of these activities based on their profiles, a paired t-test.

Ethical Consideration

This research adhered to ethical issues, since the researcher followed the required procedures in conducting the study. The researcher wrote a letter requesting permission to perform the study at the office of Tesaban Wat Maheyong School in Thailand. All sources in this paper were accurately cited, and appropriate referencing was maintained. Comprehensive information was conveyed to potential respondents and other individuals engaged in the study via consent letters or permission requests.

The approved endorsement letter from the office was included in the questionnaire checklist disseminated to the responders. The anonymity and security of the obtained data were maintained to guarantee respondents that the information utilized in this study was adequately secured.

III. RESULTS AND DISCUSSION

Demographic profile of the respondents in terms of Age, Sex, number of years in a teaching position, and highest educational attainment.

Table 1 Demographic profile of the respondents in terms of Age

	Frequency	Percent
25-30	9	18.0
31-35	19	38.0
36-40	11	22.0
41-45	9	18.0
46-50	2	4.0
Total	**50**	**100.0**

Table 1 presents the age demographics of kindergarten teachers, revealing that the majority (38%) are aged 31-35, followed by 22% in the 36-40 age range, and 18% each in the 25-30 and 41-45 categories, with only 4% aged 46-50. This indicates a predominantly young teaching workforce, particularly in their early to mid-30s, which may enhance their adaptability to technology in early

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childhood education. The younger demographic is likely more familiar with digital tools, potentially improving the implementation of technology game-based learning (TGBL) strategies. However, the small proportion of older teachers highlights a potential need for targeted training to ensure effective technological integration across various age groups.

The research conducted by Aldhafeeri and Khan (2022) indicates that educators aged 30-40 demonstrate superior digital proficiency and a greater inclination to adopt instructional technologies in early childhood classrooms compared to their older counterparts. This generational pattern indicates that age influences the confidence and frequency of technology integration in educational practices, particularly in game-based learning environments.

Table 2 Demographic profile of the respondents in terms of Sex

	Frequency	Percent
Male	23	46.0
Female	27	54.0
Total	**50**	**100.0**

Table 2 reveals that the demographic profile of respondents is nearly balanced, with 54% female and 46% male among 50 kindergarten teachers involved in technology game-based learning (TGBL). This gender balance indicates equal participation from both sexes in implementing TGBL methodologies, which can enhance diverse educational perspectives and reduce gender bias in assessing socio-emotional development in students. Consequently, this suggests that gender does not impede the adoption of digital learning tools, supporting the need for inclusive professional development and equitable access to training in technology-based teaching methods.

The research by Ding and He (2021) corroborates the finding, demonstrating that both male and female early childhood educators display comparable attitudes and competencies in employing digital tools for socio-emotional learning. It underscores that the effective integration of TGBL is primarily influenced by training and institutional support rather than gender differences.

Table 3 Demographic Profile of the Respondents in terms of number of years in a Teaching Position

	Frequency	Percent
1-4	20	40.0
5-9	15	30.0
10-14	13	26.0
15-19	2	4.0
Total	**50**	**100.0**

Table 3 reveals the demographic profile of respondents based on their teaching experience: 40% have 1–4 years, 30% have 5–9 years, 26% have 10–14 years, and only 4% have 15–19 years of experience. This distribution indicates that most respondents are early to mid-career teachers, suggesting a strong potential for adaptability and openness to innovative teaching methods, such as technology game-based learning (TGBL). The limited presence of highly experienced educators highlights a potential need for targeted professional development to address gaps in technological integration skills across different experience levels.

The results are corroborated by the research of Turan and Meral (2022), which indicated that early-career educators were more predisposed to utilize and positively evaluate the effectiveness of digital games in promoting students' socio-emotional and cognitive growth, ascribed to their technological adeptness and superior training backgrounds.

Table 4 Demographic Profile of the Respondents in terms of Highest Educational Attainment

	Frequency	Percent
Bachelor's Degree	6	12.0
With a master's degree Unit	20	40.0
Master's Degree Graduate	23	46.0
With Doctorate Degree Units	1	2.0
Total	**50**	**100.0**

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Table 4 outlines the demographic profiles of respondents based on their highest educational attainment. Key findings include that 46% hold master's degrees, 40% are pursuing master's degree units, 12% have bachelor's degrees, and only 2% are engaged in doctoral studies. This indicates a highly educated respondent group, likely knowledgeable in pedagogical theories and innovations, including technology integration and socio-emotional learning. The advanced educational qualifications suggest a proficient teaching workforce capable of implementing complex instructional methodologies like technology game-based learning (TGBL). Their background enhances their understanding of child development and modern educational practices, enabling them to tailor game-based learning to meet young learners' socio-emotional needs. However, ongoing professional development is essential to ensure these qualifications translate into effective teaching practices.

The research conducted by Chauhan and Dahiya (2021) demonstrates that educators with higher academic degrees tend to hold positive attitudes toward educational technology and show more competence in its implementation in classroom settings. Research reveals that educators with postgraduate training demonstrate more confidence in utilizing technology to improve students' emotional and social abilities, particularly when used through interactive methods like game-based learning.

Composite Mean on the challenges of incorporating technology game-based learning activities at the kindergarten level based on the respondents' perspective in terms of Adaptability, Customization, Teacher Training, and Accessibility.

Table 5 Composite Mean on the challenges of incorporating technology game-based learning activities at the kindergarten level based on the respondents' perspective in terms of Adaptability, Customization, Teacher Training, and Accessibility.

	Mean	Std. Deviation	Verbal Interpretation
Adaptability	3.62	0.22	Highly Evident
Customization	3.58	0.25	Highly Evident
Teacher Training	3.59	0.23	Highly Evident
Accessibility	3.48	0.26	Moderately Evident
CHALLENGES OF INCORPORATING TECHNOLOGY GAME-BASED LEARNING ACTIVITIES	**3.57**	**0.12**	**Highly Evident**

Legend: 4 - 3.50 - 4.00 Highly Evident 2 - 1.50 - 2.49 Slightly Evident 3 - 2.50 - 3.49 Moderately Evident 1 - 1.00 - 1.49 Not Evident

Table 5 summarizes the challenges of integrating technology-based game-learning activities in kindergarten, highlighting an overall mean difficulty score of 3.57. Key obstacles identified include adaptation (M = 3.62), teacher training (M = 3.59), and customization (M = 3.58), with accessibility (M = 3.48) also noted as a challenge. Despite recognizing the benefits of technology game-based learning (TGBL), teachers face significant hurdles in modifying activities for diverse learners, receiving adequate training, and tailoring content to specific contexts. The findings emphasize the need for robust support systems, including professional development for teachers, improved digital infrastructure, and contextually relevant resources. A comprehensive, educator-focused approach is essential for maximizing the socio-emotional benefits of TGBL for young learners.

This is related to study of Manesis (2020), factor analysis identifies three challenges to the implementation of games-based learning in early childhood classrooms: insufficient confidence, inadequate support, and lack of equipment. As teachers' self-efficacy in utilizing digital games increases, their impression of the barrier of insufficient confidence diminishes. Educators who infrequently utilize computers and digital games in the classroom regard a deficiency of confidence as a significant obstacle. Teachers in public preschools exhibit markedly higher favorable sentiments regarding the efficacy of Game-Based Learning compared to their counterparts in private preschools.

Similarly, Avdiu (2020), contemporary research indicates ongoing transformations in educational practices, with game-based learning recognized as one of the most successful methods for acquiring new knowledge over the years. This research aimed to comprehend the pedagogical methods employed in game-based learning and their significance in elementary education. The study's findings and the researcher's observations indicate that game-based learning is a prevalent pedagogical approach in Austrian primary schools, creating an enjoyable and effective atmosphere for students. The findings of this study demonstrate the methodologies employed by educators across several areas and highlight the diverse abilities and competencies that youngsters cultivate through play. Educators assert that game-based learning poses continual problems in identifying and creating varied game activities while tailoring instruction to meet the requirements and interests of students.

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The conclusion is corroborated by Alimisis's (2021) research, which claims that the effective integration of game-based learning in early education requires educators to have access to appropriate technologies and to possess the pedagogical and technical skills necessary to tailor these tools to meet diverse learner needs. His research underscores that training, accessibility, and adaptability are three fundamental pillars that must be regarded for digital tools to promote holistic learning outcomes in young children.

Composite Mean on the educational impact of technology game-based learning activities on kindergarten learners' social and academic development in terms of Cognitive Development, Learning Engagement, Social Interaction, and Motor Skills Development.

Table 6 Composite Mean on the educational impact of technology game-based learning activities on kindergarten learners' social and academic development in terms of Cognitive Development, Learning Engagement, Social Interaction, and Motor Skills Development

	Mean	Std. Deviation	Verbal Interpretation
Cognitive Development	3.44	0.20	Great Impact
Learning Engagement	3.54	0.21	Highly Great Impact
Social Interaction	3.54	0.22	Highly Great Impact
Motor Skills Development	3.44	0.23	Great Impact
EDUCATIONAL IMPACT OF TECHNOLOGY GAME-BASED LEARNING ACTIVITIES	**3.49**	**0.11**	**Great Impact**

Legend: 4 - 3.50 - 4.00 Highly Great Impact 2 - 1.50 - 2.49 Great Impact 3 - 2.50 - 3.49 Moderately Great Impact 1 - 1.00 - 1.49 No Impact

Table 6 presents a composite mean indicating that technology-based game-learning activities (TGBL) significantly impact kindergarten students' social and academic development, with an overall mean of 3.49, categorized as "Great Impact." The highest ratings were observed in Learning Engagement and Social Interaction (M = 3.54), highlighting TGBL's effectiveness in enhancing participation and peer collaboration. Cognitive Development and Motor Skills Development also received favorable evaluations (M = 3.44), indicating TGBL's role in fostering academic, physical, and intellectual growth. The findings emphasize the benefits of integrating TGBL in early childhood education, promoting holistic development by enhancing cognitive skills, building relationships, increasing motivation, and improving motor skills. To maximize these benefits, educational institutions should ensure access to suitable TGBL platforms and provide professional development for educators to effectively implement and assess these tools.

The study by Behnamnia et al. (2020) indicates that DGBL may influence students' development of creative skills, critical thinking, knowledge transfer, digital skill acquisition, and a favorable attitude toward learning while also facilitating profound and insightful learning. The pupils encountered opportunities to engage in the creative thinking process while comprehending issues and learning through instructional digital games.

Also supported by the research by Lamrani and Abdelwahed (2020), early childhood education has emerged as a significant public policy concern that profoundly influences a child's personality, upbringing, education, socialization, development, and academic achievement from preschool through university and beyond. Traditional teaching approaches typically employ a rigid learning framework that inhibits a child's motivation, creativity, and innovation. Students receive theoretical education instead of practical training, which hinders their ability to retain and recall concepts and information efficiently. Furthermore, conventional pedagogy often fails to capture the complete attention of students, resulting in diminished interaction, engagement, and commitment to the material. Consequently, the advancement of novel methodologies providing superior schooling is an efficacious means to tackle this issue. Conversely, new studies in cognitive science and educational neuroscience indicate that play-based learning is a potential method for early childhood education. Four essential success criteria for learning have been discovered to enhance children's skills: attention, active engagement, feedback, and consolidation. The proposed method introduces a digital play-based learning strategy utilizing serious games to enhance the pedagogical elements of the Montessori approach, aimed at improving children's skills throughout early education through play and gamification. It seeks to provide youngsters with a diverse array of engaging gaming activities and stimulating experiences within an interactive setting.

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The conclusion is corroborated by the research of Papadakis et al. (2021), which demonstrates that digital game-based learning significantly improves engagement, collaboration, and cognitive skill development in early childhood settings. Their research indicated that well-designed TGBL platforms tailored for young learners positively impact both academic and socio-emotional development by providing dynamic, meaningful, and enjoyable learning experiences.

Significant difference in the assessment of the respondents on the educational impact of technology game-based learning activities on kindergarten learners and the respondents' profiles

Table 7 Test of significant difference in the assessment of the respondents on the educational impact of technology game-based learning activities on kindergarten learners and the respondents' profiles

	t	df	Sig. (2-tailed)	Decision	Remark
Sex - Educational Impact of Technology Game-Based Learning Activities	-6.119	49	0.000	Reject	Significant
Age - Educational Impact of Technology Game-Based Learning Activities	-28.371	49	0.000	Reject	Significant
Teaching Position - Educational Impact of Technology Game-Based Learning Activities	-11.786	49	0.000	Reject	Significant
Grade Level Taught - Educational Impact of Technology Game-Based Learning Activities	-10.684	49	0.000	Reject	Significant

Table 7 reveals a statistically significant difference (p-values = 0.000) in respondents' assessments of the educational impact of technology-based game-learning activities on kindergarten students, based on demographic factors such as Age, Sex, years in teaching, and highest educational attainment. This indicates that these factors influence perceptions of the effectiveness of technology game-based learning (TGBL). Younger or more tech-savvy teachers tend to recognize greater benefits from TGBL, while more experienced teachers may need specialized training to adapt to digital tools. The findings suggest a need for tailored professional development and inclusive initiatives by educational leaders and policymakers to address these perception gaps and ensure equitable integration of game-based learning across diverse teaching demographics.

The results shows that Laranjeiro (2021) asserts that current research identifies tablets as the favored gadgets among preschool children, attributed to their portability, user liberty, and diverse applications. There is substantial data about the impact of digital technologies across various domains of learning at these ages. The Aprender XXI project sought to create game-based learning applications aligned with the Curriculum Guidelines for Preschool Education (CGPE). The project employed a Design-Based Research (DBR) methodology, integrating scientific inquiry with technical advancement. The project was segmented into three phases: preliminary study (literature review, exploration of existing applications, examination of preschool curriculum), development (specifications, scriptwriting, design, and programming), and assessment (user testing and conclusions). The initial investigation recognized the necessity to delineate robust applications. The assessment, including children and educators, confirmed the development and identified enhancements in the applications. The project produced four thematic applications—environment, health, citizenship, and professions—comprising a collection of games suited for independent usage by children or educator-led instructional activities in kindergarten. A website gathers children's play data, depicted as flowers in a virtual environment, to demonstrate their engagement and collaboration for an improved future.

Also, Ilgaz et al. (2020) assert that play is an inherent strength of childhood, enabling children to develop and refine essential language, cognitive, and socio-cognitive skills. This enduring concept has significantly influenced early childhood curricula, mostly by allocating time and space for unstructured play. Recently, the efficacy of play in early childhood development and its subsequent role in the early childhood curriculum has come under scrutiny, particularly in the USA. Policymakers are replacing playtime with instructional methods focused on teaching decoding skills that address a limited range of literacy and school-ready competencies. Their choice to transform the early childhood classroom into a more didactic, adult-directed teaching environment is corroborated by recent assessments of play research indicating modest or inconsistent impacts. The necessity for extensive playful learning programs that enhance free play and instructional methods is examined, highlighting the importance of disseminating playful learning strategies to educators, hence facilitating the integration of curricular objectives into playful learning activities.

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The conclusion is corroborated by a study by Zainuddin et al. (2020), which emphasized that the demographic attributes of educators, particularly their age and teaching experience, significantly influence their adoption and effective implementation of digital game-based learning in classrooms. The study underscores the importance of personalized training programs to ensure that all educators, irrespective of their backgrounds, are equipped with the essential skills and motivated to use Teaching, Learning, and Learning strategies effectively.

IV. CONCLUSION

The study reveals that kindergarten teachers are predominantly young and energetic, with an equal proportion of male and female teachers engaged in technology-enhanced game-based learning. Most teachers are in their early stages of careers, with most possessing or seeking advanced degrees. The study also highlights the challenges of incorporating technology-driven game-based learning activities at the kindergarten level, such as addressing diverse levels of technological exposure, managing limited attention spans, and supervising digital technology usage. Technology-enhanced game-based learning significantly enhances cognitive development, student engagement, and motor skill development. However, teachers' assessments of the educational impact vary significantly based on age, sex, teaching experience, and highest degree of education. These demographic traits significantly influence teachers' judgments of the value and efficacy of technology-based games in early childhood education. The proposed program aims to address deficiencies in technical skills and confidence among kindergarten educators through region-specific boot camps, tackling the gender gap in digital confidence, assisting older teachers through peer mentoring, and offering continuous professional development with certification in TGBL pedagogy. The approach emphasizes ongoing evaluation and improvement of integration strategies based on teacher feedback and student outcomes. The study concludes that a young workforce with extensive digital technology experience is receptive to technology-based learning through games, with equal gender representation. Teachers need customized professional development and structural support to effectively incorporate digital learning technology in kindergarten classes. Policymakers and school administrators must address classroom management concerns, ensure technological tools are developmentally appropriate, and provide essential skills. A comprehensive program, including regional boot camps, women-focused technology forums, peer mentoring, and ongoing assessment, is proposed. The study recommends that educational institutions should implement gender-inclusive technology game-based learning (TGBL) professional development programs, promoting cross-gender collaboration. Policymakers should establish a comprehensive framework for integrating TGBL in early childhood education, ensuring assistive technologies and equitable access to digital devices. The Department of Education should integrate TGBL into kindergarten curricula, develop individualized professional development initiatives, and establish inclusive capacity-building programs.

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