International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Development and Validation of Game-Based Learning (GBL) in Kindergarten

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Abstract

Early literacy development forms the foundation of a child's academic and communicative abilities, with games serving as a natural medium for acquiring essential reading skills. Among instructional innovations, Game-Based Learning (GBL) has emerged as an effective strategy to enhance early literacy through interactive, engaging, and differentiated activities. While international studies have demonstrated GBL's positive effects on motivation and cognitive skills, its application in rural, resource-limited settings remains limited. This study utilized a Research and Development (R&D) design guided by the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) to create and validate culturally relevant GBL materials aimed at improving literacy skills among kindergarten pupils in Flora District, Apayao for the school year 2024–2025. The developed materials included Letter and Sound Recognition, Sight Word Bingo, and Phonics Fishing, targeting phonemic awareness, word recognition, and decoding skills. Expert validation results showed mean ratings ranging from 4.41 to 4.63 (Strongly Agree) across instructional competencies, assessment, and readability. The research instrument achieved high content validity, with an S-CVI of 0.94 and a universal agreement score (S-CVI/UA) of 1, surpassing standard benchmarks. Findings confirmed that integrating peer collaboration, visual aids, and adaptable game formats effectively addressed varied learner needs, promoting literacy and engagement in kindergarten. The study recommends incorporating these GBL tools into literacy programs, providing teacher training, and conducting continuous assessment to optimize outcomes. Future research should explore the long-term effects of GBL interventions in diverse early childhood education contexts.

Keywords: Game-Based Learning (GBL), early literacy development, kindergarten education, reading interventions

Introduction

Early education lays the essential groundwork for literacy development in young children. At this stage, youngsters acquire foundational skills in speaking, reading, and writing through observation and interaction with their environment. Family members and caregivers play a crucial role in shaping early literacy experiences, with playtime serving as the primary medium through which children engage, communicate, and practice these skills.

Among emerging educational innovations, Game-Based Learning (GBL) has gained recognition for its ability to enhance early literacy through interactive, engaging, and differentiated instruction. Internationally, educators and researchers have documented GBL's positive effects on student

motivation, cognitive skills, and academic outcomes. However, the extent of its implementation and success varies widely depending on regional contexts, resource availability, and teacher preparedness.

In the Philippines, the Department of Education has long acknowledged the value of integrating technology into classroom instruction through initiatives like the ICT4E Strategic Plan. Philippine-based studies, such as those by Arciosa, Garcia, and Cadiz et al., have demonstrated the effectiveness of both digital and analog GBL approaches in improving pupil engagement and learning outcomes. Yet, disparities in technological infrastructure and access remain a challenge, especially in rural and remote communities.

In particular, Apayao province has shown growing interest in adopting innovative teaching strategies to address educational challenges and literacy gaps. Regional authorities have actively encouraged the integration of technology to support learning, although localized studies examining the specific effects of GBL on early literacy outcomes in this context remain scarce. This gap highlights the need for focused research on culturally relevant, context-sensitive GBL interventions.

Within Flora District, literacy difficulties persist in kindergarten classrooms, with data revealing that nearly 60% of pupils for the school year 2023–2024 remain at the beginner level in literacy skills. This situation underscores the urgency of adopting more engaging, interactive, and effective pedagogies that can address diverse learner needs. Research from similarly situated rural districts indicates that GBL strategies hold promise for maintaining learner interest, enhancing literacy retention, and supporting differentiated instruction.

Given these circumstances, this study seeks to develop and validate Game-Based Learning materials specifically designed to improve early literacy skills among kindergarten pupils in Flora District during the 2024–2025 academic year. The research will also gather teachers' perspectives on the benefits, limitations, and effective implementation of GBL tools in their classrooms, providing practical insights tailored to their unique educational setting.

Ultimately, the study aims to generate empirical evidence to support the integration of GBL in early literacy instruction, identify potential challenges, and offer practical recommendations for enhancing literacy teaching in similar resource-constrained environments. By doing so, it contributes to the broader goal of promoting inclusive, engaging, and effective early childhood education through innovative, play-based learning strategies.

Literature Review

Game-Based Learning (GBL) has garnered significant attention in early childhood education due to its potential to enhance literacy development through interactive and engaging methods. Research indicates that GBL positively influences cognitive, social, and emotional growth in young learners. A comprehensive meta-analysis by Alotaibi (2024) revealed that GBL has moderate to large effects on cognitive development ($g = 0.46$), social development ($g = 0.38$), emotional development ($g = 0.35$), motivation ($g = 0.40$), and engagement ($g = 0.44$) in early childhood education.

The integration of game-based learning (GBL) into early childhood education has garnered significant attention due to its potential to enhance literacy skills among young learners. GBL leverages the natural inclination of children towards play, transforming it into an effective educational tool that fosters engagement, motivation, and cognitive development.

Alotaibi (2024) conducted a comprehensive systematic review and meta-analysis, revealing that GBL has a moderate to large effect on cognitive, social, emotional, motivational, and engagement outcomes in

early childhood education. Specifically, the study reported effect sizes of g = 0.46 for cognitive development, g = 0.38 for social development, and g = 0.35 for emotional development, indicating substantial benefits across multiple domains.

In the realm of literacy, Guo (2024) emphasized the effectiveness of game-based teaching in enhancing early literacy development among kindergarten students. The study highlighted that interactive and playful activities not only improve literacy skills but also promote collaboration and independent learning, which are crucial for young learners.

Further supporting the efficacy of GBL, a study by Majebi and Akin (2024) demonstrated that game-based strategies significantly improved science content knowledge and processing skills among pre-primary children. The research indicated mean gains of 2.0 points in science knowledge and 19.45 points in processing skills for the game-based group, underscoring the approach's effectiveness in early education settings.

Moreover, Al-Khayat et al. (2024) found that GBL enhances students' motivation and cognitive skills by creating immersive and interactive learning environments. The study identified key factors contributing to the success of GBL, including the alignment of game mechanics with learning objectives and the integration of appropriate scaffolding techniques.

In the context of digital literacy, recent research published in ScienceDirect (2024) revealed that game-based literacy apps effectively support early literacy skills among preschool children from diverse backgrounds. The study found that moderate app usage times, such as half an hour per week, were particularly beneficial for literacy skill gains, especially among girls.

Additionally, Annuar et al. (2024) conducted a literature review highlighting the impact of GBL on cognitive development in early childhood. The findings indicated that GBL stimulates cognitive abilities such as problem-solving, critical thinking, and conceptual understanding, reinforcing the importance of integrating play-based learning into early education curricula.

Collectively, these studies underscore the multifaceted benefits of GBL in early childhood education, particularly in enhancing literacy and cognitive skills. The evidence suggests that when effectively implemented, GBL can serve as a powerful pedagogical approach that aligns with the developmental needs of young learners.

Theoretical Framework

This study is grounded in contemporary theories that merge game-based learning (GBL) with early literacy development models, particularly Self-Determination Theory (SDT) and Digital Play Theory. SDT emphasizes the importance of intrinsic motivation, suggesting that learners are more engaged when they experience autonomy, competence, and relatedness. This aligns with the interactive, playful nature of GBL, where children gain a sense of agency and mastery through engaging literacy activities. By incorporating autonomy-supportive features in GBL materials, the study aims to motivate kindergarten pupils to actively participate in literacy learning tasks. Complementing this, Digital Play Theory highlights the educational value of digital and interactive games, asserting that technology-enhanced play can effectively support literacy skills such as phonemic awareness, vocabulary building, and letter recognition by bridging entertainment and learning.

In addition to these, the study draws from the Emergent Literacy Perspective, which posits that literacy development begins before formal schooling through early language and print interactions. By integrating foundational literacy skills within playful, culturally relevant GBL activities, this research seeks to

address the varied learning needs of kindergarten pupils, fostering early language and reading development in a supportive, inclusive environment. Together, these theories guide the creation and validation of GBL materials tailored for early childhood education, promoting learner engagement, inclusivity, and a lifelong love for reading.

Methodology

This study employed a Research and Development (R&D) design utilizing the ADDIE model framework, which involves sequential phases: Analysis, Design, Development, Implementation, and Evaluation. The R&D method was deemed appropriate as it systematically guides the creation and validation of educational tools while ensuring their instructional effectiveness. Inspired by Galut's study on board game development, this research followed similar procedures to develop and test Game-Based Learning (GBL) materials specifically designed to improve literacy skills among kindergarten pupils in the Flora District for the 2024–2025 school year.

In the analysis phase, the researchers conducted a needs assessment to identify key literacy challenges faced by pupils, consulted teachers, and reviewed existing literature on GBL and early literacy development. These findings informed the design of instructional materials that targeted essential skills like letter recognition and phonemic awareness. The design and development phases involved creating interactive, age-appropriate literacy games, which were then subjected to expert validation. Six specialists, including district supervisors, master teachers, and experienced kindergarten teachers, assessed the materials based on alignment with educational standards, instructional design, readability, and relevance to early literacy.

The implementation phase consisted of pilot testing the validated GBL materials across multiple elementary schools within Flora District. All fifteen kindergarten teachers in the district were included as respondents using total enumeration to capture a comprehensive representation of teacher perspectives. These teachers integrated the GBL materials into their classroom activities and assessed them using a standardized DepEd validation instrument, ensuring consistency in evaluating the materials' instructional quality, engagement value, and effectiveness in enhancing literacy.

In the data collection phase, both quantitative and qualitative data were gathered. Teachers used an assessment tool to rate the materials based on criteria such as content quality, usability, and learning effectiveness. Following implementation, focus group discussions were held to gather in-depth insights into the teachers' experiences, perceived benefits, challenges encountered, and suggestions for improvement. This mixed-methods approach allowed for a more nuanced understanding of the materials' practical application in classroom settings.

Finally, quantitative data were processed using statistical tools like mean, standard deviation, and the Item Content Validity Index (I-CVI) to determine the overall validity and effectiveness of the GBL materials. A 5-point Likert scale guided the interpretation of expert ratings, while qualitative feedback from discussions was thematically analyzed to identify patterns and actionable recommendations. The results informed the refinement of the materials and were compiled into a final report for dissemination to educational stakeholders, contributing to the ongoing improvement of literacy instruction strategies in early childhood education.

Results and Discussions

To enhance literacy instruction through game-based learning, the study developed three interactive interventions tailored for kindergarten pupils. Letter Sound Safari is an engaging activity where pupils pick letter cards and match them with animal cards representing corresponding sounds, encouraging teamwork, sound recognition, and vocabulary development. Adaptations include peer support, visual aids, and movement-based actions like jumping for each sound, enhancing participation for diverse learners. This aligns with evidence showing that peer-assisted strategies and kinesthetic activities improve phonemic awareness and retention in early learners.

Sight Word Bingo helps pupils recognize common sight words using bingo cards, markers, and a master word list, fostering reading fluency in a fun, competitive format. The game is adaptable for struggling readers by allowing paired play and flashcard aids, while advanced learners can be challenged with larger grids or phrases. Finally, Phonics Fishing is a hands-on activity where pupils "fish" for word cutouts matching called-out letter sounds, reinforcing phonics skills through play. The game offers variations like timed challenges and team play, ensuring inclusivity and engagement. Together, these interventions offer differentiated, interactive literacy experiences that build foundational reading skills in an enjoyable, meaningful way.

In resource-limited areas like Flora, Apayao, early literacy development faces challenges due to limited access to engaging, interactive learning materials. Game-Based Learning (GBL) presents a promising, student-centered alternative to traditional methods, offering playful, interactive experiences that foster fundamental reading skills. Through games that involve letter-sound matching, sight word recognition, and simple word formation, GBL enhances critical early literacy components like word recognition and phonemic awareness. Tailoring these interventions to the local linguistic and cultural context makes the learning process more meaningful and effective for kindergarten pupils in the region.

Additionally, GBL promotes literacy retention through repetition, active participation, and differentiated instruction. It accommodates varied literacy readiness levels by offering adaptive activities that challenge advanced learners while supporting those who struggle. Activities such as phonics puzzles,

storytelling games, and interactive reading challenges strengthen literacy skills by integrating repeated word and sound exposure within enjoyable, playful settings. In multi-level rural classrooms, GBL's flexibility ensures inclusive, cost-effective literacy support, making it a sustainable instructional strategy for improving literacy outcomes in early childhood education.

The expert evaluation of the developed Game-Based Learning (GBL) materials yielded consistently high ratings across key instructional categories. In terms of alignment with Most Essential Learning Competencies (MELCs), the materials achieved a mean rating of 4.50 (Strongly Agree), indicating that the instructional content successfully covered and developed the targeted literacy skills for kindergarten pupils. Experts highlighted that the materials effectively addressed the core literacy competencies expected within the quarter, affirming their relevance and instructional value.

For Instructional Design and Organization, the GBL materials garnered an overall mean of 4.41 (Strongly Agree). Notable strengths included the integration of varied learning tasks, formative assessments, motivational strategies, and differentiated activities tailored to multiple intelligences and learning styles. Experts also commended the logical sequencing of content and alignment of objectives with the MELCs. Minor recommendations for improvement were suggested in areas such as enhancing instructional design elements, increasing opportunities for lesson review and integration, and further emphasizing 21st-century skills.

The Instructional Quality of Text and Visuals received one of the highest overall mean scores at 4.63 (Strongly Agree). Experts particularly praised the materials for their factual accuracy (4.87) and absence of social content violations (4.67), noting that the text and visuals were clear, developmentally appropriate, and effectively supported comprehension. While computational content accuracy rated slightly lower at 4.33, it remained within the "Strongly Agree" range, with minor revisions recommended to ensure consistency and precision in any computational elements.

In terms of Assessment, the materials also performed well, with an overall mean of 4.47 (Strongly Agree). Experts appreciated the variety of assessment types (4.80), clear instructions, engaging formats, and well-aligned answer keys. However, a slightly lower rating of 4.13 for alignment of assessments with specific lesson objectives suggested opportunities to fine-tune assessments to better track learner progress against targeted outcomes. Despite this, the overall feedback affirmed the effectiveness of the assessment strategies included in the GBL materials.

Lastly, the materials were highly rated in Readability, achieving an overall mean of 4.60 (Strongly Agree). The clarity of instructions received a perfect score of 5.00, with other components such as vocabulary appropriateness, sentence structure, and topic coherence also scoring positively. This suggests that the GBL materials are accessible and comprehensible for kindergarten learners, facilitating a smooth learning experience. Furthermore, the research instrument used to evaluate the materials demonstrated strong reliability, with all I-CVI values exceeding 0.83 and a S-CVI average of 0.94, confirming its validity and suitability for instructional material evaluation in early literacy contexts.

Conclusion and Recommendations

The study identified that enhancing Game-Based Learning (GBL) for diverse kindergarten learners can be achieved through differentiated strategies. Teachers are encouraged to implement peer collaboration for struggling readers, use visual aids such as flashcards to support word recognition, and modify game complexity for advanced learners, including adjusting bingo grids or introducing simple phrases. These strategies foster inclusivity, engagement, and individualized literacy instruction within the classroom.

In resource-constrained, rural settings like Flora, Apayao, the development of culturally relevant and interactive GBL interventions proved particularly effective. Findings showed that these game-based interventions improved foundational literacy skills, including word recognition, phonemic awareness, and reading retention, while providing engaging and student-centered learning experiences. Such locally adapted materials offer a cost-effective and practical solution to address literacy gaps in early childhood education.

Expert evaluations of the developed GBL materials yielded consistently high ratings across categories, with mean scores ranging from 4.41 to 4.63. These results affirmed the materials' strong instructional value, alignment with early literacy competencies, and engaging design. While overall feedback was highly positive, minor recommendations were noted, including improving computational accuracy, refining assessment-objective alignment, and integrating more differentiated strategies to accommodate varied learner needs.

The research instrument used to validate the GBL materials also demonstrated a high level of reliability and content validity. With 27 individual content validity indices (I-CVI) exceeding 0.83, an overall S-CVI of 0.94, and a universal agreement score (S-CVI/UA) of 1, the instrument surpassed accepted validation standards, confirming its effectiveness for evaluating instructional materials in kindergarten literacy education.

Based on these findings, it is recommended that schools formally incorporate the validated GBL materials—Letter and Sound Recognition, Sight Word Bingo, and Phonics Fishing—into literacy programs. Educators should receive targeted training on implementing these tools effectively, with adjustments made to suit various learner needs. Regular assessments are advised to track literacy progress and optimize materials over time. Additionally, fostering collaboration among teachers and conducting future research on the long-term impact of GBL materials across different educational settings is encouraged to further improve literacy instruction for young learners.

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