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Teachers' Integration of Multimedia Tools in Teaching Kindergarten: Input to Literacy and Numeracy Enhancement

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Abstract

An important stage in a child's cognitive, social, and emotional development is early childhood education. This qualitative narrative study explored how kindergarten teachers integrate multimedia tools to enhance literacy and numeracy skills. Conducted in 16 schools in the Schools District of Balasan, it involved Focus Group Discussions with 9 kindergarten teachers and In-Depth Interviews with 9 teachers and 25 parents. The study investigated the types of multimedia tools used, their benefits, challenges, and impact on young learners. Results revealed that these multimedia tools, such as educational videos, TV-based programs, interactive games, songs, and digital exercises, significantly supported literacy and numeracy development. Teachers employed structured methods that combined visual, auditory, and kinesthetic strategies to improve engagement and learning outcomes. Despite facing challenges like technical issues, limited time, and scarce resources, teachers benefited from school-based training and technical support. Parents also reported positive changes, noting increased enthusiasm, focus, and improved learning behavior in their children. Based on the findings, a Resource Guide for Teachers was developed, providing practical strategies for effectively integrating multimedia in early childhood education.

Keywords: Multimedia, Childhood education, Literacy, Numeracy, Teacher, and Qualitative narrative analysis.

1. Introduction

Early childhood education is a critical phase in a child's cognitive, social, and emotional development. In this context, multimedia tools have emerged as valuable resources for enhancing learning experiences. The integration of multimedia such as videos, interactive games, animations, and educational apps can cater to diverse learning styles and foster engagement among young learners. According to research, multimedia tools help students build core reading and numeracy skills by making abstract topics more vivid and accessible. Multimedia is the use of multiple media types, such as text, symbols, images, audio, and video, to improve learning or recollection (Guan *et al.,* 2018, quoted in Vandana & Kumar, 2023).

Developing literacy and numeracy skills in the early years sets the foundation for lifelong learning and academic success. Multimedia tools can serve as innovative avenues for achieving these developmental milestones by offering interactive and multisensory experiences. For instance, storytelling apps, digital games, and virtual manipulatives can simplify com-

plex ideas, reinforce practice, and sustain children's interest. The rapid advancement of technology has transformed the educational landscape, making multimedia tools an integral part of modern teaching practices. Multimedia tools, which include videos, animations, digital storybooks, games, and interactive applications, provide innovative strategies for teachers to engage students and meet diverse learning needs. In early childhood education, these tools hold significant potential for enhancing foundational skills in literacy and numeracy, which are critical for academic and lifelong success (Clark & Mayer, 2016).

Recognizing the growing role of these tools underscores the need to investigate their specific applications in kindergarten classrooms. Kindergarten education forms the foundation of formal learning, a critical stage for the development of cognitive, social, and emotional skills. During this period, children acquire essential literacy skills such as phonemic awareness, letter recognition, vocabulary building, and reading comprehension, alongside basic numeracy skills like counting, number recognition, arithmetic, and pattern identification (VanDerheyden & Snyder, 2006; Perena & Perez, 2019). The effective integration of multimedia tools provides opportunities to enhance these skills through engaging and interactive strategies. For instance, animations and games can simplify abstract concepts, while digital storybooks can support early reading and comprehension skills, making these tools invaluable for fostering children's development (Beluso MFE, 2025).

Traditional teaching methods, while effective in many contexts, may not fully address the diverse learning styles of young children, particularly in today's technology driven society. Multimedia technologies, because to their multimodal and interactive nature, cater to visual, aural, and kinesthetic learners, providing tailored training to address diverse needs. According to research, these tools improve students' motivation, engagement, and retention by presenting knowledge in dynamic and visually appealing ways (Mayer, 2024). Thus, the advantages of multimedia technologies are clear in their capacity to promote active learning while also providing a more inclusive classroom atmosphere. Integrating multimedia tools in early childhood education has been shown to have a considerable positive impact on literacy and numeracy outcomes. For example, interactive digital storybooks have been found to improve vocabulary acquisition and reading comprehension, whilst mathematics-focused instructional apps encourage number sense and problem-solving abilities (Maitra, 2024).

Despite their potential benefits, the incorporation of audiovisual aid in kindergarten classrooms presents several challenges for teachers. These challenges include limited access to technology, which can stem from insufficient funding or infrastructure in schools, and a lack of training, where teachers may not receive adequate professional development to effectively use multimedia tools in their teaching practices (Becirovic, 2023). Additionally, time constraints often hinder teachers from exploring and integrating new technologies into their lesson plans, especially when balancing other responsibilities. Another critical challenge is ensuring that audiovisual aid are aligned with educational goals, as not all digital resources are designed to meet curriculum standards or support age-appropriate learning objectives (Hamutoglu, 2021).

Over 12 years of teaching kindergarten, the researcher noticed significant changes in teaching methods. In the past, managing young learners was challenging since it was their first step into formal education, making it difficult to capture their attention, and much of the time was spent on discipline and preparing learning materials. Now, with televisions and internet access in the classroom, the researcher easily found interactive videos for literacy, storytelling, and gamified applications for numeracy, making lessons more engaging and enjoyable. These tools helped children learn faster and stay active in lessons, ensuring better retention of concepts. With daily practice, they retain knowledge, and even in Grade 1, they confidently told their new teachers that they have already learned the material in kindergarten. This study aimed to examine the multimedia tools commonly used by kindergarten teachers in literacy and numeracy instruction, focusing on their integration into teaching strategies and the impact on early childhood learning. By exploring the benefits of multimedia tools, educators' approaches, and the challenges encountered in their implementation, the

research sought to provide insights into effective teaching practices (Feliciano ATU, 2023).

Additionally, this investigated how multimedia influences learners' experiences, behaviors, and enthusiasm for school, particularly from the perspective of parents. The findings serve as a foundation for enhancing multimedia-assisted instruction in early childhood education, ensuring a further likable and active learning environment in the digital age.

2. Methodology

This study utilized qualitative research through narrative inquiry, which was also highly appropriate, as it allowed for the exploration of personal stories and experiences of kindergarten teachers and parents regarding the integration of audiovisual aid in education. This approach enabled participants to share their narratives, providing insights into the resources they used, the strategies they employed, the benefits they observed, and the challenges they faced.

The study involved 18 teacher participants and 25 parent participants from the Schools District of Balasan. The Schools District of Balasan comprises a total of 16 elementary schools, including 13 complete elementary schools and 3 primary schools. It is situated in the 5th District of the Northern part of the Province of Iloilo. The study followed specific inclusion and exclusion criteria to ensure relevance and meaningful insights. These criteria ensured the selection of participants who could contribute effectively to the study's objectives.

As a data-gathering technique, in-depth interview and Focus Group Discussion (FGD) were conducted with participants using a researcher-made interview guide. This employed two distinct sets of researcher-developed interview guides to gather essential information from participants. The same interview guide was used for both the FGD and in-depth interview with kindergarten teachers. This decision ensured consistency in exploring their experiences, strategies, challenges, and insights regarding the integration of multimedia tools into teaching literacy and numeracy. The interview guide addressed core themes derived from the study's objectives, including resources utilized, strategies employed, benefits observed, and challenges encountered in the integration of multimedia tools. Its structured yet open-ended questions provided opportunities for educators to delve deeply into their collective experiences during FGDs while allowing for individualized perspectives during one-on-one interviews.

For parents, a separate interview guide was developed to cater to their unique observations and perceptions of how multimedia tools impact their children's literacy and numeracy development. The questions in the parents' interview guide were crafted to explore factors, such as their awareness of multimedia tools, the perceived benefits to their children, challenges encountered, and their overall engagement in the learning process. To ensure the clarity and effectiveness of the parents' guide, the questions, originally written in English, were translated into Hiligaynon by a professional fluent in both languages. This translation enabled parents to express their thoughts and experiences more comprehensively, capturing the nuances of their perspectives on multimedia tool integration.

Both interview guides underwent validation by a panel of experts, the advisory committee, and the examining committee. This validation process ensured that the guides were reliable, aligned with the study's objectives, and capable of eliciting rich qualitative data from the participants. The open-ended nature of the questions facilitated meaningful discussions and responses, which were essential for understanding the participants, lived experiences with multimedia tools in early childhood education. Interview and FGD were conducted respectfully and professionally, ensuring participants felt comfortable sharing their insights and experiences throughout the process.

The interview and FGD were recorded, transcribed, coded inductively, and analyzed using thematic analysis to uncover detailed insights into the resources utilized, strategies employed, benefits observed, challenges encountered, and outcomes of integrating multimedia tools in teaching and learning. This method allowed for a comprehensive exploration of the experiences and perceptions of kindergarten teachers and parents. By examining these themes, the study provided actionable recommendations for

enhancing multimedia integration in early childhood education based on the findings of the study.

In analyzing the responses of the participants, this study followed a systematic approach to thematic analysis as outlined by Braun and Clarke, (2021) employing a structured and systematic approach for analyzing qualitative data. The process began with familiarization with the data, where interviews were recorded through video and audio-taping and transcribed into text. The researcher thoroughly reviewed the transcriptions to immerse in the dataset and gain a deeper understanding. Following this, initial codes were generated by identifying significant themes, ideas, and recurring patterns within the data. These initial codes served as the foundation for the next step, which involved searching for themes. During this stage, the researcher grouped related codes to form meaningful and coherent themes. These themes were further classified to organize them into broader categories, ensuring a structured analysis. The next phase involved defining and naming the themes, providing detailed descriptions and comprehensive interpretations that reflected the participants' insights and experiences. This was followed by reviewing themes to ensure consistency and coherence across the dataset, refining the findings where necessary. Finally, the researcher produced the report by synthesizing the identified themes, patterns, and insights, returning to the original interviews for verification to ensure the accuracy and validity of the findings.

Confidentiality and privacy were strictly upheld throughout the data collection and analysis process. The researcher ensured that participants' identities were anonymized through the use of pseudonyms, and any identifying information was removed from the transcriptions and reports. Video and audio recordings and transcripts from interview and focus group discussion were securely stored and accessed only by the researcher. Additionally, the researcher adhered to data protection protocols to prevent unauthorized access and misuse of sensitive information. This approach aimed to build trust with participants and protect their narratives and experiences. The researcher upheld the principle of objectivity and fairness in analyzing the data and presenting the findings. While the researcher's background as a kindergarten teacher with experience in multimedia tools provided valuable insights, efforts were made to minimize bias and subjectivity. The researcher conducted member-checking by allowing selected participants to review the themes and interpretations to validate the accuracy and authenticity of their narratives. Moreover, the study followed the ethical guidelines set by the academic institution and complied with the ethical standards for research involving human participants. These measures ensured the integrity and credibility of the research findings.

3. Results and Discussion

The study revealed that multimedia tools, such as educational videos, TV-based learning, and interactive math games, played a crucial role in enhancing literacy and numeracy instruction in early childhood education. The integration of songs, chants, and digital exercises effectively reinforced key learning concepts, while games and quizzes provided immediate feedback that boosted student motivation and engagement. Teachers carefully selected multimedia tools based on pupils' learning needs, age, and engagement levels to ensure alignment with instructional goals. Differentiated instruction was achieved through learner observation, hands-on activities, and inclusive teaching strategies that accommodated diverse learners.

For literacy, teachers integrate educational videos, digital storybooks, interactive worksheets, songs, rhymes, and flashcards to enhance phonics, comprehension, and vocabulary. Videos simplify concepts using animations and storytelling, while digital storybooks combine text, visuals, and audio to improve engagement. Interactive worksheets and songs reinforce learning through play-based activities and repetition. These findings aligned with Brown *et al.* (2017) who emphasized the effectiveness of multimedia in literacy development.

Teachers use math-based games, digital exercises, interactive learning materials, songs, and chants to develop number recognition, counting, and problem-solving skills for numeracy. Games and exercises promote active engagement, while songs and chants aid in memorization. This supported research by

Kehrer *et al.* (2019) and Abdulrahaman *et al.* (2020), who highlighted the role of multimedia tools in enhancing numeracy learning.

Teachers mitigate these issues by integrating multimedia with hands-on activities, discussions, and interactive engagement, ensuring meaningful learning experiences (Duran, 2022). Future research should explore ways to further optimize multimedia-based instruction (Gee, 2017). Neumann, (2018) highlighted the role of multimedia-supported instruction in improving learning outcomes by catering to different sensory modalities and learning styles. Additionally, Mayer, (2020) emphasized the importance of visually stimulating and interactive learning materials in engaging young learners and promoting active participation. These studies provided a foundation for understanding the effective use of multimedia tools in enhancing literacy and numeracy skills among kindergarten learners.

Brown *et al.* (2017) emphasized the role of educational videos in improving young learners' vocabulary, phonics skills, and comprehension. Their study highlighted how visual and auditory stimuli make abstract concepts more concrete, fostering better understanding and retention in literacy education.

The study also found that multimedia integration was applied daily and strategically woven into lesson phases, ensuring continuity and effectiveness in early childhood education. Teaching strategies incorporated visual and auditory learning approaches, allowing students to absorb information through multiple modes. Additionally, hands-on application with interactive tools enhanced student comprehension and retention. The study further demonstrated that multimedia tools positively influenced student engagement, motivation, and skill development, making learning more dynamic and interactive.

Lesson phases helped ensure that multimedia is used strategically within the learning process, enhancing engagement and learning outcomes. By aligning multimedia use with structured lesson phases, teachers maximize student engagement and retention. Knudson and Wallace, (2019) emphasized that purposeful integration of multimedia across different instructional stages improves comprehension and information recall. However, Timotheou *et al.* (2023) highlighted challenges in digital accessibility, noting that resource gaps may hinder effective multimedia integration in lower-tech environments.

The study highlighted that multimedia tools significantly improved literacy and numeracy skills, particularly in areas such as phonics, vocabulary building, reading comprehension, number visualization, and pattern recognition. Their use fostered engagement, enthusiasm, and independent learning, making lessons more interactive and enjoyable. Teachers benefited from simplified lesson preparation and access to diverse teaching resources, while students experienced improvements in cognitive function, memory, motor skills, and self-guided exploration. Collaborative learning was also strengthened through group activities, enhancing teamwork and communication among learners.

The findings were consistent with Otaiba *et al.* (2019) research, which emphasized explicit and systematic instruction in phonemic awareness and word reading skills. It was noted that teaching speech sounds and their mapping to letters and patterns significantly enhances early literacy skills. Similarly, Buckingham *et al.* (2019) explored systematic phonics instruction, highlighting its critical role in developing letter-sound correspondences and decoding abilities, which in turn improve reading fluency and comprehension. These studies collectively underscore the importance of building phonics vocabulary as a foundation for literacy development. In contrast to the result, Abdulrahaman *et al.* (2020) discussed the challenges of using multimedia tools in education. They highlighted that while multimedia enhances engagement and retention, it can sometimes lead to dependency on technology, which may reduce opportunities for critical thinking and interpersonal interactions. Additionally, Caridah *et al.* (2024) pointed out that the effectiveness of multimedia tools can be limited in settings with inadequate resources or technological infrastructure, potentially hindering equitable access to quality education.

The study identified several challenges that teachers encountered in integrating multimedia tools into their

teaching practices. Limited access to digital resources, particularly in underfunded schools, restricted the full implementation of multimedia-based instruction. Teacher training gaps prevented some educators from maximizing the potential of digital tools, leading to inconsistent application. Additionally, technical issues, such as software malfunctions and unreliable internet connectivity, disrupted lesson flow. Balancing screen time while ensuring meaningful engagement with traditional learning materials posed another difficulty, requiring teachers to develop blended approaches that integrated both digital and hands-on activities effectively.

Zhang and Ching, (2021) emphasized that persistent software glitches, connectivity issues, and hardware limitations create barriers to seamless integration. These problems affect the accessibility of digital learning resources, particularly in under-resourced schools, where technological support is minimal. The lack of standardized training in troubleshooting multimedia further complicates usage, leaving many teachers ill-equipped to resolve technical issues efficiently. Huda, (2024) identified key obstacles that hinder the effective use of multimedia tools in education, including slow internet connectivity, lack of teacher training, inadequate digital classroom infrastructure, and inconsistent teacher-student ratios. The findings revealed that many educators are reluctant to adopt multimedia resources due to these challenges, as they disrupt the teaching-learning process and reduce instructional efficiency. However, Neumann, (2018) stressed that structured digital integration, such as preloading content, utilizing offline resources, and having backup instructional plans, helps mitigate technical setbacks. Instead of hindering instruction, multimedia tools, when effectively managed, can create interactive, engaging, and adaptable learning environments, making lessons more dynamic and accessible for students.

The study found that parents became aware of multimedia use in teaching primarily through children sharing school experiences and discussing lesson activities. Parents noted both positive and negative behavioral changes influenced by multimedia use, such as increased curiosity, enthusiasm, and participation, but also potential distractions or overreliance on digital tools. Additionally, school excitement was driven by interactive learning activities, social interactions, engaging teaching styles, and multimedia integration, all of which contributed to a dynamic learning environment.

Parents observed their children's behavior by actively watching and understanding their children's actions, reactions, and overall development. This was important because it allowed parents to gain insights into their child's individual needs, interests, and learning styles, ultimately helping them provide better support and guidance.

The viewpoints expressed by every participant emphasized particular improvements in the children's academic achievement and development that are ascribed to multimedia resources. Children's role-playing as "teacher-teacher" at home and their replication of the teacher's activities demonstrate how interactive teaching techniques and multimedia resources help kids internalize and repeat skills they have learnt. The way the child participates in the classes and homework shows how multimedia may reinforce learning outside of the classroom. Similar to this, the child's capacity to remember teachings and connect them to classroom experiences demonstrates how well multimedia technologies work to improve understanding and memory retention. The highlighted significant improvements in academic skills, such as counting, identifying letters, and writing, are attributed to consistent exposure to multimedia-based learning.

Difficulties in maintaining discipline and inconsistent engagement at home contrast with the structured and focused learning environments that multimedia tools aim to create.

Xie *et al.* (2021) study, which examined parent attitudes and digital educational resources, demonstrated how multimedia integration increased student motivation and engagement, particularly among younger students. Parents reported that learning became more relatable and knowledge gaps were filled with interactive technologies.

4. Conclusion

Multimedia tools positively impact early childhood learning by increasing engagement, comprehension, and adaptive instruction. Their ability to provide interactive and varied learning experiences supports individual learning styles and fosters a more dynamic educational environment. Effective multimedia implementation enhances both literacy and numeracy development, making education more accessible and engaging for young learners. Strategic and consistent use of multimedia tools in classroom instruction improves learning experiences, engagement, and comprehension. By combining structured integration, diverse teaching strategies, and interactive applications, educators create an enriching environment that fosters skill development and motivation among learners. Integrating multimedia tools into early childhood education positively impacts literacy and numeracy skills, student engagement, motivation, and instructional effectiveness. Its strategic use enhances cognitive development, independent learning, and teamwork, creating a more dynamic learning environment. Multimedia tools play a vital role in enhancing literacy and numeracy instruction in early childhood education. Their integration fosters engagement, motivation, and interactive learning experiences, making lessons more effective and enjoyable. Additionally, multimedia-assisted instruction simplifies lesson preparation for teachers while supporting student skill development in cognitive, memory, motor, and independent learning abilities. Furthermore, the study emphasized that collaborative learning improves through multimedia-based activities, strengthening teamwork and communication among learners. These insights highlight the importance of optimizing multimedia integration to maximize its benefits in early childhood education. Multimedia plays a crucial role in influencing children's learning experiences, engagement, and behavioral development. Parents gain awareness of multimedia use through their children's discussions and observations of behavioral changes. Additionally, a combination of interactive activities, social interactions, and multimedia-supported teaching strategies significantly enhances school excitement and motivation among learners.

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6. Conflicts of Interest

The author confirms that there are no conflicts of interest.

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