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EFFECTIVENESS OF SUPPLEMENTARY LEARNING MATERIALS UTILIZING DIGITAL PLAY-BASED LEARNING PACKAGE

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Abstract:
This study explores the potential of digital play-based learning packages to enhance the reading and counting skills of young learners in kindergarten. The subjects of this study were the 30 kindergarten learners of Shuttle Elementary School, South Fatima District, Barangay San Jose, General Santos City enrolled during school year 2021-2022. This study used the pre-experimental design, specifically, the single group pre-test and post-test design. Frequency counts, mean and t-test were utilized to interpret and analyze the gathered data. Based on the findings, it was found out that Digital Play-Based supplementary learning packages were effective and had improved the reading and counting skills of kindergarten learners. Nevertheless, the use of Digital Play-Based Supplementary Learning Packages may be implemented in teaching reading and counting among young learners in the academe. Ultimately, this study provides valuable insights for educators who seek to promote creativity and engagement in their classrooms, and underscores the importance of leveraging technology in support of learning outcomes.

Keywords: educational management, kindergarten learners, digital play-based learning, supplementary learning materials, Philippines

1. Introduction

Many of the problems that early childhood education teachers face is not brand-new. Some of them have been in existence for a while. Thus, changes in the classroom, for example, can lead to some new problems. Even the most committed teachers encounter challenges while working with young children. Separation anxiety, establishing friends, relating to the teacher, communication challenges, adjusting to the school environment,

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eating troubles, short attention spans, and other concerns are some that even the most committed teachers cannot avoid (Tennant, 2019).

However, there is a belief that playing internet video games is not good for kids' development. Nothing could be more from the truth, and there are many intricate reasons for this, but it also makes sense when someone considers the fundamental advantages of game-based learning. However, most parents view digital technologies as having primarily good aspects. Measuring what happens during digital play may be challenging, and it can be equally difficult to understand how screen time fits into pre-existing conceptions of children's play (Disney et al., 2019; Syam, 2022).

Unfortunately, some identified preschoolers in Shuttle Elementary School, South Fatima District, Barangay San Jose, General Santos City, experienced difficulties and frustrations in learning. Parents of preschoolers are struggling with how to educate their children so they can learn in a fun and efficient way. Young learners can play, enjoy, and learn all at once using digital play-based supplemental learning packs.

While there is a growing body of literature on the use of digital play-based learning packages in early childhood education, there is still a need for further investigation into the effectiveness of such materials. Specifically, there is a gap in understanding how supplementary learning materials utilizing digital play-based learning packages can enhance the reading and counting skills of kindergarten learners. As such, this study seeks to address this gap by examining the impact of digital supplementary materials on the learning outcomes of young learners. As a kindergarten teacher, the researcher witnessed how hard it is to teach young learners. The researcher used to think of many teaching strategies to catch the learners' attention so they could learn effectively. The researcher conducted this study to determine if digital play-based supplementary learning packs effectively enhance the reading and counting skills of Shuttle Elementary School kindergarten learners in the school year 2021-2022. The use of technology in education has become increasingly prevalent in recent years, particularly in response to the COVID-19 pandemic which has disrupted traditional classroom learning. Given this context, it is urgent for educators to explore the potential of digital learning materials to enhance student engagement and academic performance. Moreover, early childhood education is a critical period for the development of foundational literacy and numeracy skills, which are crucial for future academic success. As such, the findings of this study have the potential to inform pedagogical practices and support the development of effective learning strategies for young learners.

2. Research Objectives

With the aim of unlocking the potential of digital play-based learning, this study endeavors to investigate the effectiveness of supplementary materials in enhancing the critical reading and counting skills of kindergarten learners at Shuttle Elementary School during the 2021-2022 academic year.

Specifically, the following objectives were formulated:

1) To determine pre-test scores of kindergarten learners before using the supplementary materials utilizing a digital play-based learning package.
2) To ascertain, the post-test scores of kindergarten learners after using the supplementary materials utilizing a digital play-based learning package.
3) To find out the significant difference between the pre-test and post-test scores of the kindergarten learners in reading and counting after the treatment.

2.1 Hypothesis

H_{o1}: There is no significant difference between the pre-test and post-test scores kindergarten learners utilizing digital play-based learning package.

3. Review of Related Literature

This section deals with the related literature and studies relevant to the present study.

3.1 Digital Play-Based Learning

The term "Digital Game-Based Learning" (DGBL), in the majority of studies referring to Marc Prensky's book of the same title, embraces "*any marriage of educational content and computer games*". Prensky points out that the learning process is very much related to the learners' motivation. Although academic learning presupposes high-quality, meaningful content, it appears challenging to increase learners' involvement. However, computer games hold the player's attention very effectively, but with less meaningful material until now (Edwards, 2019; Kainulainen, 2019).

In addition, Digital Game-Bases Learning (DGBL) are the expression of connecting the teaching process to the new learning technologies, the classic computer and/or other related devices or possibilities such iPod, iPhone, console, smart board, and other platform. This means that young children are active users of technologies and digital media content (Prensky, 2021).

Moreover, digital game-based learning has been more extended than people might believe. Duck-Duck-Goose is a popular game with young children that can be used to teach them rules, focus, and a variety of motor skills. The Oregon Trail was one of the first games made for educational purposes in the DGBL universe. Moreover, children learned about pioneer life in 1974 thanks to the movie The Oregon Trail. Teachers could completely immerse their learners in the subject matter because of this ground-breaking idea. DGBL has become increasingly practical both within and outside the classroom as technology has advanced (Green & Holloway, 2019; Larkin & Lowrie, 2019).

Consequently, it may be concluded that DGBL facilitates a reasonable symbiosis of meaningful content (learning) and an engaging environment(games) transformed through digital media. In addition, DGBL is the expression of connecting the teaching process to the new learning technologies, the classic computer, and other related devices or possibilities such as iPod, iPhone, console, smart board, and other platforms. It means

young children actively use technologies and digital media content (Lawrence, 2018; Nichols Hess & Greer, 2016).

Furthermore, the essential benefits of Digital Game-Based Learning (DGBL) include promoting a positive attitude toward learning and developing memory skills. As well as its potential to connect learners and help them build self-constructed understanding, involving the entire class of learners in the active learning process, and it may constitute an efficient and effective tool for motivating learners and engaging them in active learning (Lynch & Redpath, 2019; Utomo, 2021).

Meanwhile, young children in the 21st century are known to be active users of technology. Technology use by young children has introduced a new concept into early childhood education and care - that of digital play. The idea of digital play is related to the emergence of the digital age as a cultural context for young children's growth and development in the 21st century. Researchers now consider young children's use of such technologies as 'domesticated.' The domestication of technologies provides new opportunities for children's play. These opportunities facilitate children's interactions with digital technologies in a way that was not possible in previous generations before the digitization of information via micro-processing (Mitgutsch, 2018; Nilsen et al., 2021). According to research, preschool instructors' intentions when using digital play pedagogically are crucial for the learning results of their learners. Digital technologies must be introduced and used effectively by preschool instructors to be used as a tool for children's learning. Similarly, digitalization generally has modest but beneficial effects on learning, but these benefits can be increased if digital technologies are used in education with specific objectives. Experts concur that how preschool teachers plan digital play activities will affect the children's educational capacity (Palmér, 2019; Van der Westhuizen & Hannaway, 2021).

In addition, preschool teachers should implement a form of digital play that is collaborative and non-competitive, and monitoring peer play is essential to reach that objective. The pedagogical value of collaboration claims that the level of digital competence training depends on the participants' collective work. Preschool teachers are urged to consider the ability to tailor the usage of digital space to children's specific requirements, in addition to the chance to promote children's collaborative abilities with digital play. Teaching with mobile technology must be authentic, allowing for individualized instruction and group projects. Digital personalization also incorporates techniques, items, and procedures to serve various functions in the preschool learning environment. It also appears crucial that preschool teachers participate in the kids' digital play (Plowman, 2016; Veraksa et al., 2022).

On the other hand, Kjällander and Riddersporre (2019) confirm how preschool teachers and children seem to prefer to use open-ended apps that have a variety of possible solutions and allow children to explore and make several attempts to find solutions. Furthermore, it can be challenging to predict whether preschoolers will utilize an app under its planned didactical design due to its originality and playfulness. Transgressive play is a characteristic of children's digital play with apps.

Meanwhile, teachers must engage learners in exploratory discussions when using technology in the classroom. From an academic standpoint, using a digital and an analog memory game can result in various activities, which implies that preschool teachers should consider the pedagogical results of the digital play activities they decide to use. The multiple apps affect preschool teachers' communication with the kids differently (Dýrfjörð, & Hreiðarsdóttir, 2021; Fleer, 2018; Tennant, 2019).

Moreover, concerns for upcoming research and development include the need for well-designed apps and maybe excessive faith in the technology's intuitiveness. For instance, in online chats, Swedish preschool teachers should have considered the features and benefits of various apps (Burnett & Merchant, 2018; Edwards & Mercer, 2018).

3.2 Importance of Digital Play-Based Supplementary Learning Materials

Digital game-based learning involves learning through the completion of tasks on computers, mobile devices, or tablets. Fun, play, goals, competitiveness, and problem-solving are just a few components of digital game-based learning. Digital game-based knowledge in various topics, including English, math, science, and STEAM, has been studied. The findings show that digital game-based learning is gradually gaining popularity and can help learners learn more effectively and with greater motivation while lowering their cognitive load and anxiety (Genlott & Gronlund, 2016; McPake, et al., 2018).

In addition, a sizable percentage of kids exposed to digital games can enhance learning in a world that improves language education. Only some people experience this due to the widening digital divide. Youngsters in South Africa limited access to data and digital gadgets. A factual study examined how educators perceive and employ digital play. Most people agree that technology develops and supports early childhood education strategies. The child is an expert in their own digital game, where they are knowledgeable. Their apparent disparities are at play in the social environment they inhabit. Experts stress that digital match is similar to all forms of p, even more so when combined with conventional pedagogies (Leung et al., 2020; Neumann & Neumann, 2017).

Moreover, digital play in an online playground entails developing a delightful virtual world with 'multiple learners closes to the resource and making an effort to engage in some, even if not directly directing the technology. It is anticipated that such an encounter will trigger a wide range of social behaviors shaping how learners use technology. There is a digital divide in South Africa, where things are more difficult due to due, among other things, poverty's restraints. The ability to use computers and data (Bauer et al., 2017; Syam, 2022; Whitton & Moseley, 2021).

Meanwhile, the idea of digital play aims to comprehend how kids may use, investigate, and play with digital devices as how they do with more traditional play activities. It describes any type of play that kids might engage in with toys and digital devices. These might be using an app to doodle, dancing along to a song on YouTube, or pretending to use a broken-down cell phone to make calls. Digital play may entail

interacting with voice assistants in imaginative and amusing ways. It is like trying to find questions they cannot answer or asking them for jokes and stories, or it may involve playing with toys, pets, and dollhouses that have been digitally enhanced (Berson et al., 2019; Johnston, 2021).

Furthermore, in digital play, technological experiences are incorporated into various play activities rather than being kept apart from play, as is typical when technologies are thought of as instruments for gaining access to information or exchanging ideas. The expanded definition of digital play means that, far from being a passive activity, it can involve various active activities that can be done outside. It includes using a GoPro camera while climbing a climbing frame, playing with activity trackers, operating remote-control cars, using walkie-talkies, or operating remote-control vehicles (Connolly et al., 2021; Danby et al., 2018).

3.3 Types of Digital Play-Based Supplementary Learning Materials

According to the study, children should have access to a wide variety of digital media and technologies that represent what is utilized and valued in their communities because the number of options is continually growing. Research has looked at the effectiveness of various digital apps and books as well as their effects on learner learning to help teachers choose these digital items (Al-Awidi & Alghazo, 2021; Howard et al., 2017).

Moreover, apps can encourage or stifle children's play and creativity, depending on their quality. Use caution when using media marketed as "educational" because many fails to incorporate elements like challenge, fun, and flexibility and instead emphasize structured, goal-oriented play. Despite being touted as promoting learning via play, commercially produced games are frequently built on drill and practice, offering a workbook-like activity where kids must choose the correct response. While it is commonly believed that doing this can help kids get ready for school, it can soon get dull and give kids the idea that learning is all about filling in the blanks or arranging letters or numbers in a particular order. Other apps only require kids to click or push a button to initiate an action. It is simple for kids to use and can boost their confidence, but it also encourages them to keep pressing without giving it any thought (Isikoglu et al., 2019; Miller, 2018).

Correspondingly, the finest apps and technologies encourage kids' exploration, experimentation, and curiosities by allowing them to independently make sense of their experiences and outcomes and draw conclusions. They might entail producing original music, stories, or artworks (rather than coloring in pre-drawn outlines), or they might include detailed animations or videos. Children favor apps that are imaginative and engaging, according to some research. The app or assignment must also be at the appropriate difficulty level for kids since when applications are too tricky, kids tend to lose interest, disengage, or quit using them altogether. They may also try classes one at a time until they succeed. They may mimic familiar interactive games like peek-a-boo or relate to children's everyday activities like dressing or doing the dishes. However, it is also crucial to avoid limiting the choice of digital apps based on a child's developmental

stage, as there are many products made for adults and older kids that, when given the right direction and assistance, can be fun for young kids (Marklund, 2020; Prensky, 2021).

On the other hand, compared to traditional printed texts, the effects of digital textbooks and books on children's learning and development have been thoroughly studied. However, since so many contextual and individual factors affect how children learn from books, it is not easy to draw generalizations in this field. According to research, reading a text in either a digital or printed version does not significantly affect learning results. Repeated readings of a text in any media are linked to better learning. The results of other studies are less consistent. Still, most of them found that homework-printed books helped youngsters understand tale structure and details better, and such speaking was more expansive and cognitively challenging (Ringsdorf, 2022; Rosas et al., 2020).

However, one study says toddlers prefer printed books. Digital books are reportedly very interesting for toddlers and young children, resulting in increased levels of attention, happy emotions, speaking, and better recall of new vocabulary. According to specific research, digital books, particularly texts emphasizing words and letters, have a better effect on developing reading abilities. Children's interactions with digital books are discovered to be mediated and supported by digital animations, which improves the kids' independence and self-confidence as readers. Digital books can inspire more feedback on pictures than printed texts can (Cahyaningrum et al., 2016; Edwards, 2021).

Furthermore, interactions with digital texts are frequently centered on controlling behavior and kids' behaviors with the device, including controlling how often the kid hits a sound button or coaxing the kid to turn the page, diminishing engagement with the text itself. Because the adult's attempt to read the story obstructs the youngster from using other features, including animations, adults and children may become frustrated (Falloon, 2018; Flewitt et al., 2016).

3.4 Advantages of Digital Play-Based Learning

The power of games is harnessed as a teaching tool in game-based learning to establish and support learning objectives. It is accomplished in a GBL atmosphere using instructional games with elements like engagement, quick rewards, and friendly competition. All this is done to keep learners interested in learning while they play. Everyone can benefit from game-based understanding, from preschool through post-secondary education and beyond, which is lovely. Additionally, it is irrelevant where or how learners' study; they can do so by using authentic items, playing online games, or working alone or in a group (Howard et al., 2017; Larkin & Lowrie, 2019).

In addition, Falloon (2018) stresses the importance of apps matching the learning characteristics of the target student group. He promotes apps that have an appropriate blend of game, practice and learning components and would like apps to communicate learning objectives in ways that young children can understand, that pathways to achieve goals should be smooth or free from distractions and that apps should incorporate formative corrective feedback.

Moreover, researchers and educators argue that game-based learning might harm the educational process. Nevertheless, research keeps demonstrating how beneficial games can be for things like pupils' arithmetic and language skills. Game-based knowledge: Aids in problem-solving – Learners can solve problems using game-based knowledge to develop abilities like logic, reasoning, and decision-making that they can apply outside the classroom. Encourages critical thinking - According to research, GBL can help learners build their necessary thinking abilities, including forming their own opinions before participating in group discussions and reflecting with guidance (McPake et al., 2018; Neumann & Neumann, 2017).

Furthermore, digital play-based learning increases learner motivation and engagement. Studies have shown that when teachers incorporate components of digital game-based learning into their instructional design, such as feedback, choice, and collaboration, learners become more interested in and motivate to learn. Digital play-based learning introduces situational learning. Learning is a fundamentally social activity. Learners learn new ideas through GB in the context of their interpersonal connections. Special education classrooms benefit from GBL's attention to their requirements. Researchers discovered that game-based learning is essential for kids with individualized education plans to assist with direct instruction, establish a positive environment, and foster academic success (Miller, 2018; Van der Westhuizen & Hannaway, 2021).

3.5 Application of Digital Play to Preschoolers

Young children's play is crucial for their brain development. The brain's anatomical makeup is thought to be shaped through games, promoting active learning and strengthening neural connections. Games enable kids to explore, identify, negotiate, take risks, and create meaning while improving "*flexibility and better capacity for learning later in life*." Additionally, kids who regularly partake in high-quality play activities are more likely to acquire memory and language abilities and control their conduct (Green & Holloway, 2019; Larkin & Lowrie, 2019).

Moreover, a high-quality play-based program should include a daily schedule for indoor and outdoor physical activity. Also, it has thin corporates of music, movement, creative expression, and adult-child interactions that serve as role models for moderate to vigorous levels of physical activity. According to studies, play-based learning is more efficient than direct instruction methods, which are the more conventional academic-focused teaching approaches (Palmér, 2019; Van der Westhuizen et al., 2021).

Meanwhile, the proponents of digital game-based learning (DGBL), who have spent years researching and evangelizing, have been caught off guard. Proponents of the DGBL have been shouting to be heard over the bias against games, like someone who continues to call when loud music abruptly stops. However, suddenly, everyone is paying attention to us right now. Three forces working together have led to a significant increase in public interest in video games as teaching aids. The first component is the continuing research that advocates of DGBL do. Since the invention of digital games,

academics have released scores of essays, articles, and popular books on the effectiveness of DGBL (Plowman, 2016; Veraksa et al., 2022).

In addition, there is a limited but growing corpus of literature on DGBL as it embodies well-established learning principles, theories, and models due to the extensive study that many serious game proponents have been doing on how games may be utilized for learning. However, many DGBL supporters have spoken out against the risks of "academizing" games. It is partially a product of the edutainment software used over the past ten or so years; instead of utilizing the learning potential of games (Lawrence, 2018; Nichols Hess & Greer, 2016).

Similarly, it is important to distinguish the hype from reality to approach DGBL objectively and practically. When people first learn about games' success, they often wonder if it is feasible to examine the subject thoroughly; others have already conducted one. Games consistently promote learning and shorten instructional time across various disciplines and ages. It is according to numerous reviews of the gaming literature over the past 40 years, including some studies that use rigorous statistical techniques to analyze findings from multiple meta-analyses (Al-Awidi & Alghazo, 2021; Dýrfjörð and Hreiðarsdóttir 2021; Fleer, 2018).

Furthermore, according to a review of the DGBL literature, educators have generally adopted three strategies for incorporating games into the learning process. They were first having learners create their games, having teachers. Second, game developers make educational games to teach learners, and third, they incorporate commercial off-the-shelf (COTS) plays into the classroom. In the first strategy, learners assume the role of game designers and learn the subject matter while creating the game. Learning programming languages has always meant that learners learn to solve problems. Teams of programmers and artists work on professional games for one to two years (Mitgutsch, 2018; Nilsen et al., 2021).

However, although this learner-designed approach to DGBL need not produce games of a professional caliber, it is still a time-consuming procedure that has traditionally only been used in the field of computer science. Modern game design can certainly cross multiple disciplines (art, English, math, psychology). Still, only some teachers have the necessary skill sets, teach subjects that allow for quality content, and have the time to implement this kind of DGBL or teach within the traditional institutional structure, frequently hindering interdisciplinarity. These factors make it unlikely that this strategy will be extensively adopted (Burnett & Merchant, 2018; Edwards & Mercer, 2018).

Consequently, teachers can create games that smoothly combine gameplay and learning in the second scenario. This professionally developed DGBL process is more resource-intensive than the first choice. Still, it is sometimes referred to as the "Holy Grail" approach to DGBL since it can fulfill both instructional and entertainment needs equally and can do so with almost any domain. It is due to the requirement that the games be on par in terms of functionality and quality with commercially available off-the-shelf (COTS) games, which are extremely good at teaching the knowledge, abilities, and

problem-solving required to win the game. Such "serious games" are evolving more frequently, and the initial products' quality is encouraging (Palmér, 2019; Whitton & Moseley, 2021).

Moreover, the third method, including commercially available digital game-based learning, entails employing already-existing games in the classroom that were not necessarily created as learning games. The games aid, facilitate, and evaluate learning in this method. This strategy may be used with any domain and learner and is currently the most time and money efficient of the three. The gameplay design should be left to game designers, and the learning method should be left to teachers to maximize quality (Al-Awidi & Alghazo, 2021; Dýrfjörð and Hreiðarsdóttir 2021; Fleer, 2018).

Meanwhile, to investigate the application of commercial off-the-shelf games in European schools, the National Endowment for Science, Technology, and the Arts (NESTA), a game creation business, and Entertainment Arts (EA), a game creator, have teamed up. In the United States, similar projects are being developed. According to a study, this tactic is gaining popularity since it is valid and has the potential to be successful. Let us assume that American instructors use games in the classroom at a rate comparable to that of British teachers (60 percent). In that case, 12, then the country may be in an excellent position to start producing the data necessary for the game industry to start creating serious games. (Plowman, 2016; Veraksa et al., 2022).

In addition, there are certain drawbacks to integrating commercial off-the-shelf games. Since commercial games are not meant to be educational, the range of themes and the quality of the information may vary. The major challenge in using commercial off-the-shelf DGBL is that it calls for rigorous study and matching the game's content, strengths, and weaknesses to the subject matter to be examined. The fact that we hardly ever acknowledge how sophisticated our learning taxonomies are compared to the taxonomy of games in DGBL debates is the proverbial "elephant in the room." There are ways to lessen these drawbacks, some of which the teacher will discuss later. Only some games will work as well at every level of learning. For instance, card games are ideal for fostering the ability to match concepts, manipulate numbers, and recognize patterns (Lynch & Redpath, 2019; Utomo, 2021).

In addition to Mishra P. & Koehler J. (2006) argue that teaching with mobile technologies needs to be done in an authentic way that enables opportunities for personalized learning as well as collaboration. While, Falloon (2018); Flewitt et al., (2016) describe digital personalization as a combination of practices, products and processes that can take various forms and that can be used to fulfil different purposes in the preschool learning environment. Preschool teachers' participation in children's digital play also seems to be important.

According to experts, the market for high-quality apps for preschool use has evolved, giving preschool teachers more options for the digital tools they want to utilize. Nevertheless, according to other studies, many apps do not have the characteristics that would make them effective in a preschool setting, and some preschool teachers find it challenging to identify and use useful apps (Berson et al., 2019; Johnston, 2021).

On the other hand, preschool teachers do not want to be reduced from professional educators to merely suppliers of repetitive content. Therefore, they believe planning opportunities for preschool instructors are crucial for successfully integrating technology instruments. Apps that provide auditory, visual, or human ways of the communication might improve children's agency or active participation in digital play, depending on the apps chosen. Different aspects of the app affect kids' involvement and conversation (Lawrence, 2018; Nichols Hess & Greer, 2016).

Furthermore, the significance of apps also aligns with the learning preferences of the intended learner population. He advocates for apps that effectively combine gaming, practice, and educational elements and wants apps to convey learning objectives in a way that even young children can grasp. Goal-achieving routes must be simple or free of distractions, and the apps must include formative and corrective feedback (Bergen, 2019; Connolly et al., 2021).

In the meantime, a contrast between the two types of apps asserted that learners become information consumers with secure applications while becoming knowledge creators with open-ended apps. Preschool teachers and learners favor using open-ended apps that offer a variety of potential solutions and encourage exploration and knowledge discovery. Teachers who are skeptical about the educational value of digital play may be more persuaded by the study on using tablets in the classroom (Isikoglu et al., 2019; Mitgutsch, 2018).

According to the study, children who played with various digital resources at home and in their preschool could master operational characteristics, broaden their knowledge and awareness of the world, and assist the growth of positive dispositions like perseverance and independence. On the other hand, if digital technologies were used as multipurpose tools interwoven with other activities, novel forms of play and learning would occur in learning environments where children could access them (Disney et al., 2019; Whitton & Moseley, 2021).

Uniquely, Mitgutsch et al. (2018), states that today's young kids are noted for being frequent consumers of technology. Digital play is a new idea that has been introduced to early childhood education and care as a result of young children using technology. The idea of digital play is related to the emergence of the digital age as a cultural context for young children's growth and development in the 21st century. Technology has been "domesticated," according to researchers, when used by young children, opening up new play possibilities for them. These chances allow children's engagement with digital technologies in a way that was not conceivable in prior generations before the digitalization of information via micro-processing (Mitgutsch, 2018; Nilsen et al., 2021)

Similarly, there is an interplay between children's digital play and their activities in the physical learning environment. Using an app does not necessarily mean that the children's work with physical objects in preschool will decrease. Correspondingly, closed apps position learners as consumers, while open apps position learners as knowledge producers. They point out that using more open apps helps create learning situations that

resemble the more fluent way that IT is being used outside the formal school context (Ringsdorf, 2022; Rosas et al., 2020).

However, the lack of well-designed educational apps and a strong belief in the intuitiveness of the technology are concerns for future research and development. Furthermore, the same teachers interacted differently with children depending on the apps used. Different apps were also found to influence child participation and dialogue differently. Consequently, adult mediation concerning computer use in preschool positively affected children's play experiences. The preschool teachers in their study were able to manage their interaction with the children in ways that supported the learning process while also providing the children with an appropriate level of autonomy, choice, and control when playing and learning with the computers (Cahyaningrum et al., 2016; Edwards, 2021).

Finally, our cultural practices have been computerized to the degree that will have future social consequences in our lives. Therefore, they argue that technological advances' results should be integral to classroom activities. However, they also emphasize teachers' responsibility to ensure that the technology in question is introduced and used in a way that can develop the learners' ability in critical reflection and make sure that what they learn will support them in their roles as citizens. The research findings show that young children and digital technology play can be helped with evidence-based teaching strategies. Still, first, the practitioner needs to have a well-developed understanding of the role and potential of Information and Communication Technology (ICT) in supporting young children's learning, as well as practical skills in knowing how to make the best use of the technology (Bauer et al., 2017; Genlott & Gronlund, 2016).

The above-related literature and studies have provided the researcher with significant insights that are valuable in this research undertaking, specifically in developing and validating digital play-based learning resource material for improvement. Experts claim that preschools currently use this technology. The preschool teachers' choice of strategy is still up in the air. Preschool instructors' apprehension about digital space may also have been influenced by the literature on what constitutes children's digital play and how it might be used in preschool settings, which is rarely discussed. As a result, it is intriguing to draw attention to what preschool teachers believe about the pedagogical use of digital play.

Similarly, those preschool teachers need to develop strategies to create open-ended learning activities using IT and to develop an ability to observe and respond to children's initiatives. Moreover, digital play amplifies the need for children to work more consciously with the rules and roles designed into apps, thus creating new possibilities for complex play. Suppose digital pedagogy is to be theorized in the early childhood education setting. In that case, using digital technologies needs to capture both the children's perspective and the teaching perspective as a relational whole.

4. Theoretical Framework

This study was anchored on Bloom's Digital Taxonomy by Andrew Churches (2010) that the framework elaborated by Bloom and his collaborators consisted of six major categories: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. The categories after Knowledge were presented as "skills and abilities," with the understanding that knowledge was the necessary precondition for putting these skills and abilities into practice. Learners can progress from lower-order skills, such as recalling information and defining terms, to higher-order skills. Lower-order abilities are also described as using knowledge in novel contexts, seeing connections between concepts or ideas, and assessing and evaluating content to form judgments or decide whether the information is reliable while producing content. To enhance learner learning outcomes and experiences, Bloom's Digital Taxonomy strives to teach instructors how to use technology and digital tools. As technology becomes a more ingrained fundamental component of learning, it tries to expand on the abilities connected with each level. The focus of this updated version and the examples of tools it provides should be on how the devices might work as vehicles for shifting learner thinking at various levels rather than on the tools themselves.

The following theories supported this: First, the Technological, Pedagogical, and Content Knowledge (TPACK) Theory by Mishra and Koehler, (2006). TPACK is a technology integration framework that recognizes three types of knowledge teachers must combine for successful EdTech integration: technological, pedagogical, and content knowledge. Most instructors and administrators understand the advantages of technology in the classroom, whether it is for preparing learners for a technologically driven future or making course, school, and district management easier. However, many people believe technology will solve all of their problems. It is sometimes assumed, whether deliberately or unconsciously, that digital tools can improve education on their own. It is why the TPACK framework is so critical. It is tempting to believe that incorporating a superb LMS into the class strategy will improve learning.

Secondly, the Connectivism Theory by Stephen Downes (2008) was another theoretical basis for this study. Connectivism is a relatively recent learning theory that proposes that learners link their ideas, views, and general knowledge in a productive way. It recognizes that technology is an essential element of the learning process and that our constant connectivity allows us to make decisions about our education. It also encourages group cooperation and discussion, allowing for multiple perspectives and viewpoints when making decisions, solving problems, and making sense of data. Connectivism encourages learning outside of the classroom, such as through social media, online networks, blogs, and information databases. Coffey (2020) states Digital game-based learning (DGBL) is a teaching strategy that blends educational material or learning principles into video games with the intention of engaging students. Constructivist educational philosophy is incorporated into applications of digital game-based learning. Digital game-based learning (DGBL), which draws on the constructivist

educational theory, combines educational content with computer or video games and may be used to nearly all subject areas and ability levels. Digital gaming as a learning tool, according to its proponents, offers interactive learning opportunities for pupils instruction and aids in getting them ready to participate in the technologically advanced, globally connected world of the twenty-first century.

Lastly, The Substitution, Augmentation, Modification, and Redefinition (SMAR) Model by Sahin & Akkoc (2020). As teachers try to customize learning and help pupils visualize complicated topics, the SAMR model was established to provide a common language across disciplines. When integrated classroom technology enables teaching and learning to be a more seamless experience for educators and learners, the SAMR Model can be beneficial. Substitution, Augmentation, Modification, and Redefinition are the four steps in the SAMR model. "Enhancement" processes include Substitution and Augmentation, whereas "Transformation" steps include Modification and Redefinition. Consider the difference between seasoning an old family recipe (improvement) and developing a new, unique meal creation (Transformation).

5. Conceptual Framework

Figure 1 presents the conceptual framework of the study. As shown in the figure, the digital play-based learning package will be tested for its effectiveness in pupils' learning of letters and counting. It is determined through the use of pretest and post-test scores.
The first box presents a digital play-based learning package. It is a supplementary learning material that is presumed to have an effect on preschoolers' reading and counting skills. Thus, it was developed.

The small boxes in the diamond form in between the two main boxes are the pretest and post-test, which will tell whether the learning package used is effective or not. They serve as the key indicators of the usefulness and effectiveness of the material.
The second big box reveals the result or the effectiveness of the digital play-based. In this stage, if found effective, then it will be highly recommended for adoption and use in preschools particularly among kindergarten learners.

Contrary to popular belief, digital game-based learning has been around for a lot longer. Children enjoy the game Duck-Duck-Goose, which can be used to help them learn, how to concentrate, and a variety of motor skills. One of the games created for educational purposes in the DGBL universe was The Oregon Trail. In addition, The Oregon Trail, a 1974 film, taught kids about pioneer life. This revolutionary idea allowed teachers to fully engross their students in the subject matter. As technology has advanced, DGBL has become more useful both inside and outside of the classroom (Green & Holloway, 2019; Larkin & Lowrie, 2019).

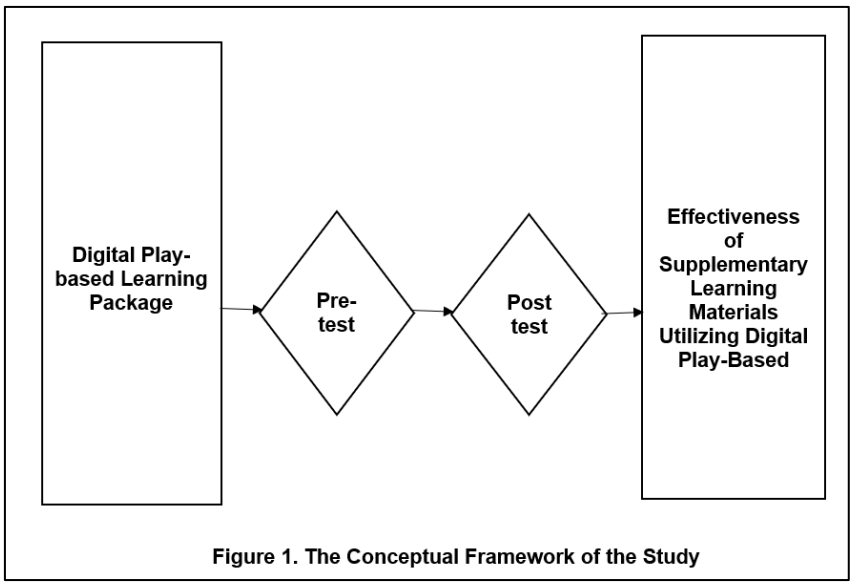

Figure 1. The Conceptual Framework of the Study

6. Significance of the Study

The global significance of this study lies in its potential to inform the development and implementation of effective digital learning strategies in early childhood education. With the increasing availability of digital technologies, there is a growing need for evidence-based approaches to integrate these technologies into the classroom in a way that supports learning outcomes. The findings from this study on the effectiveness of supplementary learning materials utilizing a digital play-based learning package can be used to inform the design and implementation of similar programs in other educational settings.

Furthermore, this study's focus on enhancing reading and counting skills among kindergarten learners is particularly relevant given the importance of these foundational skills for future academic success. Ultimately, this study's contributions can help to promote the use of effective digital learning strategies in early childhood education, with the potential to improve learning outcomes and support children's overall development. The findings of this study on the effectiveness of supplementary learning materials utilizing digital play-based learning package have significant implications for the Department of Education, teachers, learners, and future researchers. For the Department of Education, the study's results can serve as a basis for the development of policies and guidelines related to the integration of digital technologies in early childhood education. For teachers, the study provides valuable insights into the use of digital play-based learning materials as a supplementary tool to enhance reading and counting skills among kindergarten learners. The study's findings can also inform the design of teacher training programs to enhance teachers' skills in using digital technologies for instructional purposes.

For learners, the study's contributions can potentially improve learning outcomes and support children's overall development by providing an engaging and effective way to learn foundational skills such as reading and counting. Finally, for future researchers,

this study's theoretical framework, methodology, and findings can serve as a reference for similar studies in other educational settings and with other subject matters. Overall, the significance of this study lies in its potential to inform educational practice and contribute to the improvement of early childhood education, benefiting both teachers and learners.

7. Definition of Terms

For further understanding, the following terms are operationally defined as to how they are used in the study:

- **Digital Play-Based Learning (DPBL)**. As used in this study, it refers to the supplementary learning materials utilized in teaching reading and counting among kindergarten learners in Shuttle Elementary School, South Fatima District, Barangay San Jose, General Santos City.
- **Supplementary Learning Material**. Supplemental materials refer to the learning materials designed to provide learners with engaging activities through which they develop skills, acquire concepts and be responsible for their learning (Cahyaningrum et al., 2016). In this study, supplementary learning material is the developed digital play-based learning activities that aim to improve preschoolers' reading and mathematical skills. The DPBL as supplemental material is created through PowerPoint Presentation using graphics, audio materials, interactive displays, and hyperlink.

8. Methodologies

8.1 Research Design

This study used the pre-experimental design. Specifically, the researcher utilized the single-group pre-test-posttest design. The one-group pretest-post-test design is without a control group. However, it has a pre-test or a baseline observation (O1), which allows the investigator to determine the effects of the treatment by comparing the pre-test and post-test (O2) results. This design is subject to validity and treats history, maturity, testing, instrumentation, and statistical regression (Siedlecki, 2020; Stratton, 2019).

The study on the effectiveness of supplementary learning materials utilizing digital play-based learning package used a pre-experimental design, specifically the single-group pretest-posttest design. This design involves measuring the dependent variable (in this case, the reading and counting skills of kindergarten learners) both before and after the intervention (use of digital play-based learning materials). The results are then compared to determine whether there was a significant change in the dependent variable. The use of this design allows the researcher to evaluate the effectiveness of the intervention within the same group of participants, minimizing the effects of individual differences and extraneous variables.

The produced digital play-based supplemental learning materials served as the foundation for assessing preschoolers' performance. They took the Pre-test and Post-test. In the design phase, media selections were made for the digital play-based supplemental learning tools. Supplementary materials were created during the development phase under choices made during the design phase. The product was entirely produced during the implementation phase, and learners and teachers were instructed on how to utilize the tools. Additional tools were also tested with the target audience. Both the formative and summative portions of the evaluation stage offered chances for user feedback.

The pre-test and post-test design with nonequivalent groups, one of the most basic techniques for evaluating the efficacy of an intervention, is expanded by pretest-posttest designs. In this two-group design, one group receives the treatment, and the final findings are compiled. The same tests are administered to the control group during the same time period in the absence of any therapy. If the intervention had a significant impact, it can then be determined by statistical analysis. One typical instance of this is in medicine, where researchers can test a drug's efficacy by giving it to one group while withholding it from the control group. While frequently using two groups, this style of design can also be a little more complicated. For instance, the design can be based on numerous groups if various dosages of treatment are examined (Little et al., 2020).

8.2 Research Locale

This study was conducted at Shuttle Elementary School, General Santos City. The school was established in 2011 and has catered to learners from preschool to grade six. In school year 2020-2021, the school has 427 total enrollees and 15 elementary teachers serving the learners and the entire school community. In addition, there are a total of 64 kindergarten learners enrolled in Shuttle Elementary School in the current school year. Out of 64 learners, the researcher only chose 30 kindergarten learners as the respondents of the study.

Shuttle Elementary School is a safe, healthy and intellectually stimulating learning environment. This school belongs to medium size since have 14 teachers. 39% of IP learners enrolled in this school. Shuttle Elementary School promotes also Indigenous People cultures and traditions. School provides friendly, conducive learning, and embraces the ideas that all learners can learn.

General Santos City, also known as GenSan, is a vibrant and progressive city located in the southern part of the Philippines. It is situated in the province of South Cotabato and is known for its rich cultural heritage, natural beauty, and thriving economy. It is recognized as the "Tuna Capital of the Philippines" due to its significant contribution to the country's tuna industry. The city boasts a bustling fish port where tons of freshly caught tuna are unloaded and processed daily, making it a hub for tuna export and distribution. Aside from its prominence in the fishing industry, General Santos City has also diversified its economic activities, with sectors such as agriculture, trade, commerce, and services playing vital roles.

Figure 2. The Philippine Map and the Locale of the Study

8.3 Population and Sample

The study subjects were the 30 kindergarten learners of Shuttle Elementary School, South Fatima District, Barangay San Jose, General Santos City.

Table 1 presents the distribution of the subjects.

Table 1: Distribution of the Subjects

Boys	Girls	Total
15	15	30

The entire population was used in this investigation. Thus, total enumeration was utilized. The researcher considered 100% of the population. Whole population sampling is a kind of purposive sampling technique that involves examining the entire population (Lieberman & Singh, 2017).

The aim of this study was to include kindergarten learners who were enrolled in kindergarten or preschool programs. The focus was on evaluating the effectiveness of supplementary learning materials that utilized a digital play-based learning package. Participants were required to actively engage with the digital play-based learning package for a specific duration of time, allowing for a thorough assessment of its impact. The study measured learning outcomes related to cognitive development, language skills, problem-solving abilities, and social-emotional development.

Participants from higher grade levels were excluded from this study to ensure a specific focus on kindergarten learners. Supplementary learning materials that were not digitally based or did not involve play-based learning approaches were also excluded. Participants who did not actively engage with the digital play-based learning package or

had minimal exposure to it were not included. Additionally, research studies with insufficient data or incomplete information about the implementation and evaluation of the supplementary learning materials were excluded. Participants who faced significant language or cultural barriers that may have hindered their engagement or understanding of the digital play-based learning package were also excluded.

Participants who chose to withdraw from the study at any point had their data and results excluded from the final analysis. Non-compliance with the prescribed guidelines for engagement with the digital play-based learning package could also have resulted in data exclusion. In case of technical issues that significantly disrupted the implementation or data collection process, the affected data may have been withdrawn from the final analysis. Furthermore, if any data collected from participants was found to be invalid or unreliable due to errors or inconsistencies, it was withdrawn from the final analysis to ensure the accuracy and validity of the findings.

8.4 Research Instrument

The instrument utilized in this study was a researched-made questionnaire. The pre-test and post-test were composed of 30 items. The Cronbach alpha results obtained 0.89, which determined as good.

To validate the worksheets used, the researcher subjected it to validation and checking of the validators using following criteria: goals, notions, competency, purposes, relevance, and acceptability. The researcher instruments were aligned and improved using guidelines and Processes for Learning Resources Management and Development System (LRMDS) Assessment and Evaluation of locally Developed and Procured Materials. Using this method, one could determine if the examinee passed or failed an item. A (1) was assigned for a pass for a failure.

Kuder-Richardson Formula 20 was used to determine the dependability coefficient process. Hence,

$$\int \left[\frac{\square}{\square}\right] \left[\frac{SD^2 - \sum piqi}{SD^{2]}\, xx = NN-1}\right. \quad \frac{\sum(x-\bar{x})^2}{n-1}$$

Where N is the number of items, SD^2 denotes the variance of test results, and $piqi$ denotes the product of the proportion of passed and failed items for item. The researcher symbolized the proportion of individuals giving items by the sign pi, and the proportion declining by qi, where $qi = 1 - pi$. The following steps were scrupulously followed by the proponent when implementing the Kuder-Richard Formula 20:

First, the researcher computed the variance SD^2 of the test scores for the whole group. Second, she determined the proportion that passed each item (pi) and failed each item(qi). Third, she multiplied (pi) and (qi) from each item; and summed for everything. It gave the $\sum piqi$ Value. Finally, the researcher substituted the calculated values in the formula.

After that, the researcher computed the data and, based on the computation, whether the 60 Test Instrument piloted was valid and reliable.

After knowing the instrument's reliability, the proponent did the item analysis to determine each item's difficulty index and discrimination. To do this, she strictly followed simple but effective procedures for item analysis:

The researcher arranged the test scores from the highest to the lowest in the first step. Second, she got one-third of the papers with the highest and one-third the lowest scores. The idle one-third was set aside. Third, she counted the number of learners in the upper and lower groups who chose the options. Fourth, she recorded the frequency from step 3. Fifth, she estimated the index of difficulty. She used the following formula:

$$\text{Index of difficulty} = \frac{\sum x}{N} x\ 100$$

Where $\sum x$ is the sum of the correct answer of the upper and lower groups, and N is the number of cases in both the upper and lower groups. Difficulty implies the percentage of getting the correct answer to each item. The lower the rate, the more complex the thing is. The majority criterion (50% plus one) is the basis for interpreting the difficulty index, whether the item is difficult or easy. When the item has a 50% difficulty index, it is neither easy nor difficult; the lower the percentage, the more complex.

The proponent had estimated the item's discriminating power. She compared the correct responses from the upper and lower groups to evaluate the item's discriminatory power. The index of discrimination can be computed efficiently using this formula:

$$\text{Index of discrimination} = \frac{RU - RL}{NG}$$

Where RU is the proper response of the upper group, RL is the correct response of the lower group, and NG is the member of pupils in each group.

The discriminating power of an item is at most 1.00. A maximum of positive discriminatory power was revealed by an index of 1.00. It is obtained when all upper-group pupils choose the correct answer and not the lower group. Negative discriminating power is obtained when more pupils in the lower group get the correct answers than the upper group. Moreover, a zero-discriminating power (0.00) attains when the equal frequency of the upper and lower groups receives the correct answer. The items having negative and zero discriminating power should be revised or improved.

Table 2: Index of Discrimination and Difficulty of test Item

INDEX OF DISCRIMINATION	ITEM EVALUATION
0.40 or higher	Very Good Item
0.30 – 0.39	Good Item
0.20 – 0.29	Marginal Item
0.19 or below	Poor Item
INDEX OF DIFFICULTY	**ITEM EVALUATION**
0.70 or higher	Low Difficulty
0.31 – 0.69	Moderate Difficulty
0.30 or below	High Difficulty

The proponent had retained the items that passed the difficulty and discrimination index in the item analysis. Other things that marked revision or improve carried out. The 60-item test underwent face validation. It was validated by three (3) experts who are Master teachers. The instrument was validated using the following criteria: clarity of direction and indicators, presentation and organization, suitability of indicators, adequacy of indicators per category, congruency to the purpose, the impartiality of the researcher, and appropriateness of the options and evaluation rating system. Through their expertise, they made revisions and improvements. The instrument obtained an overall mean of 4.88 and was described as excellent. Then, the researcher would know if the test is valid and reliable.

Out of the 60-item Test in Mathematics 3 that went through validation and piloting, the researcher developed an official 30-item Test that she had used in the pre-test and post-test activities from the supplementary materials.

8.5 Data Collection

This study's data collection procedure involved securing of approval letters and consent forms, selecting a panel of evaluators, evaluating the learning resource, data treatment, and analysis.

In the development and preliminaries, the researcher commenced the evaluation process by the panel of experts with the developed supplementary material as a learning resource for kindergarten. The researcher sent a letter of request and invitation to the identified evaluators. When the recommendations were consented to, the evaluation was enacted. The evaluators used the LRMDS evaluation rating sheet for non-print materials composed of criteria on content, instructional, technical, and other findings on errors.

The researcher submitted an application form to the Ethics Review Committee before the initial interview, waiting seven days for processing and reviewing of all required data until approval was granted by the Research Ethics Review Committee. Subsequently, the researcher sent a letter to the Graduate School Dean, requesting permission to conduct the study.

Next, researcher primarily sent a letter requesting approval to conduct the study to the General Santos City Division addressed to the Schools Division Superintendent. Upon the approval of the request, the researcher sent a letter addressed to the school principal of Shuttle Elementary School for the conduct of the study. When the request was granted, the researcher developed the materials needed considering the identified competencies. The materials were subjected to a pilot run for review and editions for improvement before the evaluation.

The researcher provided a clear explanation to the respondents about informed consent, inclusion criteria, and the option to withdraw from the study. Upon obtaining the respondents' approval, informed assent was sought from the parents, with the researcher thoroughly explaining the study and its protocols. After receiving parental approval, the study commenced in accordance with the established standards.

Then, the evaluation results were treated using a statistical tool to draw further analysis and interpretation. The evaluation results were used as references for further improvement of the material to attain its purpose to be recommended for use.

After retrieving the research instruments, the researcher tabulated the data. Tabulation is suitable according to the subproblem asked in chapter 1. Data were processed quantitively to arrive at scientific analysis and interpretation of results. The researcher made sure that the data matrix based on dummy tables suggested by the statistician and adviser was used to organize, summarize, and analyze the data on the variables that differ from one another.

8.6 Statistical Tools

Statistical treatment was utilized to analyze the assessment and to ensure that the first draft of the pre-test was suitable to the standards,

- **Frequency counts.** It was used to treat the data gathered in answer to sub-problems numbers 1 and 2.
- **Wilcoxon Signed Rank Test.** It was used when the sample size is small and is the appropriate test of the difference between two groups if the distribution is not normal. It compared the means of the two independent groups in answer to sub-problem 3.

8.7 Ethical Considerations

This quantitative research has ethical implications due to the methodology involved. The ethical challenges include proper operation of the study, confidentiality, and anonymity. The study followed the standards of the RMMC Ethics and Review Committee for ethical consideration, particularly in addressing the population and data. The participants have the right to privacy, which would not be infringed upon without their informed agreement, under the existing Data Privacy Act 2012. The respondents' identities would not be included in the survey questionnaire, and the information they provided remained secret.

The most important details in this text were that the participants have the option to withdraw from the study at any time, any data gathered was protected, and the release of any information followed a strict informed consent process. The researcher informed the respondents of why they have become part of the study, explain the purpose of the survey, prioritize the welfare of the respondents, and ensure that the respondents were physically, emotionally, and socially ready. The research would benefit the respondents since the results would serve as an eye-opener for school administrators, and instructors in enhancing the critical reading and counting skills of kindergarten learners. The researcher must have positive character and integrity, which were associated with moral virtues and values, and have better knowledge about the paradigm of plagiarism to have a credible research paper. Fabrication is not an indication or cue of a purposeful misinterpretation of what would be done.

The most important details in this text were that the study has no making up of data and results or purposefully putting forward conclusions that were not accurate, that the researcher employs and integrates theories related to the information and other inferential concepts, that the study has no conflict of interest (COI), that the researcher has no control or influence over the respondents, that the study has no trace of misleading the respondents about any possible danger, and that the researcher has permission from the Organization/Location.

The researcher of this study followed protocols such as seeking approval from the School Principal for the conduct of the study through a formal letter, orienting the respondents before administering the survey questionnaire, and authorship. The researcher is currently enrolled in the RMMC Graduate School and had undergone a series of revisions for her thesis based on her adviser's suggestions and recommendations. An in-depth interview entails conducting intensive individual interviews with a few respondents to learn about their viewpoints on a specific idea, program, or problem. The success of an in-depth interview is determined by the interviewer's and researcher's personal and professional skills, as well as the researcher's ability to listen carefully and comprehend the participants' answers. Additionally, the researcher and interviewer must have a clear and logical mind and think critically.

Furthermore, during the conduct of the study, the well-being of the participants was considered, and any possible factors that affect the participants were acknowledged and addressed.

In conclusion, the researcher ensured the validity and reliability of the collected data by following the criteria of validation.

9. Results

9.1 Pretest Score of Kindergarten Learners in Reading and Counting

Table 3 below presents the data on the pre-test scores of kindergarten learners in reading and counting before the utilization of the digital play-based package. As revealed, the respondents' mean score is 8.9, which is means they have low skills in reading and counting. Frequency counts and percentage distribution were utilized to treat the data gathered.

Data revealed that out of 30 kindergarten learners, 19 got low scores, 7 got very low scores, four got average scores, and none obtained high or very high scores. This implies that the respondents need more engaging materials for them to master and enhance their skills in reading and counting, for these are fundamentals and essentials as they pursue learning the education realm.

The Philippines shared a significant rate of low performers among all PISA-participating countries and economies. That is, 80% of Filipino students did not reach the minimum level of proficiency in reading. Their poor scores in English, Mathematics, and Science are attributed to their student's ability in basic reading and comprehension. This being the case, the Department of Education (DepEd) has launched the Hamon: Bawat

Bata Bumabasa (3Bs Initiatives), in order to intensify the advocacy for reading and by pledging commitment to make every learner a reader at his/her grade level Tomas et al (2021).

Table 3: Frequency counts and Percentage Distribution of Pretest Scores of Kindergarten Learners in Reading and Counting

Pupil	Frequency	Percentage	Description
1	7	23	Low
2	9	30	Low
3	5	17	Very Low
4	7	23	Low
5	17	53	Moderate
6	11	37	Low
7	6	20	Very Low
8	15	50	Low
9	6	20	Very Low
10	8	27	Low
11	5	17	Very Low
12	11	37	Low
13	12	40	Low
14	5	17	Very Low
15	6	20	Very Low
16	9	30	Low
17	16	53	Moderate
18	6	20	Very Low
19	7	23	Low
20	7	23	Low
21	7	23	Low
22	9	30	Low
23	10	33	Low
24	13	43	Moderate
25	11	37	Low
26	9	30	Low
27	9	30	Low
28	9	30	Low
29	10	33	Low
30	13	43	Moderate
TOTAL	**275**	**912**	
MEAN SCORE	**8.9**	**30.4**	**Low**

As Burnett and Merchant (2018) claims, the lack of well-designed educational apps and a perhaps too strong belief in the intuitiveness of the technology are concerns for future research and development. This is confirmed by Palmér (2019) who argues that apps influence child participation and dialogue differently. Meanwhile, Lynch and Redpath (2019) make a distinction between two kinds of apps and argue that with closed apps the learners become consumers of knowledge and with open-ended apps they become producers of knowledge.

The idea of "digital play" aims to comprehend how kids may use, investigate, and play with digital devices as how they do with more traditional play activities. It describes any type of play that kids might engage in with toys and digital devices. These might be using an app to doodle, dancing along to a song on YouTube, or pretending to use a broken-down cell phone to make calls. Digital play may entail interacting with voice assistants in imaginative and amusing ways. Such as by trying to find questions that they cannot answer or by asking them for jokes and stories, or it may involve playing with

toys, pets, and dollhouses that have been digitally enhanced (Berson et al., 2019; Johnston, 2021).

9.2 Post-Test Score of Kindergarten Learners in Reading and Counting

Table 4 below presents the data on the post-test scores of kindergarten learners in reading and counting after the treatment. The respondents obtained a mean score of 20.5 which falls on a high skill level.

Data revealed an improvement in scores. Out of 30 kindergarten learners, 16 obtained high scores, eight obtained average scores, and 6 got very high scores. This means that the use of digital -play based learning package help improve the learners' performance, as indicated in the mean score.

Digital game-based learning can be used by educators to support students in developing skills. Digital game-based learning can take learning to the next level and support educators in creating a 21st-century classroom. Then integrating technology into the classroom, it is important to do so in a purposeful way and to use research-based strategies and tools. Digital game-based learning is appealing to use in the classroom because it changes the learning environment (Serrano, K., 2019).

Table 4: Frequency counts and Percentage Distribution of
Post-Test Scores of Kindergarten Learners in Reading and Counting

Pupil	Frequency	Percentage	Description
1	14	47	Moderate
2	29	97	Very High
3	22	73	High
4	26	87	Very High
5	19	63	High
6	19	63	High
7	24	80	High
8	19	63	High
9	30	100	Very High
10	13	43	Moderate
11	23	77	High
12	20	67	High
13	21	70	High
14	18	60	Moderate
15	22	73	High
16	25	83	Very High
17	30	100	Very High
18	26	87	Very High
19	19	63	High
20	12	40	Moderate
21	16	53	Moderate
22	19	63	High
23	20	67	High
24	21	70	High
25	24	80	High
26	23	77	High
27	19	63	High
28	17	57	Moderate
29	15	50	Moderate
30	13	43	Moderate
TOTAL	**614**	**2059**	
MEAN SCORE	**20.5**	**68.6**	**High**

Consequently, Howard et al. (2017) found that adult mediation in relation to computer use in preschool had a tendency to affect children's play experiences positively. The preschool teachers in their study were able to manage their interaction with the children in ways that supported the learning process while also providing the children with an appropriate level of autonomy, choice and control when playing and learning with the computers. Research has looked at the effectiveness of various digital apps and books as well as their effects on learner learning to help teachers choose these digital items (Al-Awidi & Alghazo, 2021; Howard et al., 2017).

9.3 Effectiveness of Digital Play-Based Supplementary Learning Packs

Table 5 reflects the effectiveness of the digital play-based supplementary learning packs in improving the reading and counting skills of kindergarten learners of Shuttle Elementary School. The t-test was used. The result revealed a significant difference at the .05 level with the df of 19. The required t-value of significance was 1.729. It was found that the computed t-value of 3.85 was higher than the tabular value of 1.699. It results in the rejection of the null hypothesis. This means that the supplementary materials effectively improved kindergarten learners' reading and counting skills.

Table 5: Effectiveness of the Supplementary Materials Utilizing Digital play-based Learning Package Struggling in Mathematics

Variable	df	T		Decision	Analysis
		Computed	Tabular		
Pre-test Score versus Post-test Score	n-1 29	10.89	1.699	Reject null hypothesis	Digital play-based supplementary learning packs affect learners.

10. Discussion

10.1 Pretest Score of Kindergarten Learners in Reading and Counting

The pretest scores of kindergarten learners in reading and counting before the utilization of the digital play-based learning package were low. Low pre-test scores in reading and counting can indicate that a student may need additional support or resources in these areas. To improve reading, teachers and parents may need to assess the student's specific needs, and provide targeted instruction and practice in areas where the student is struggling, including phonics, comprehension, and vocabulary. For counting, students may benefit from additional practice opportunities for basic math concepts, such as number recognition, counting, and addition/subtraction, using manipulatives or interactive materials, and as they progress, from support in more complex math concepts. The result of the study is substantiated by McPake et al. (2018), who claims that it can be challenging to predict whether preschoolers will utilize an app under its planned didactical design due to its originality and playfulness. Transgressive play is a

characteristic of children's digital play with apps. Meanwhile, teachers must engage learners in exploratory discussions when using technology in the classroom. Using a digital and an analog memory game can turn into different activities from a pedagogical perspective, suggesting that preschool teachers need to reflect on the educational outcomes of the digital play activities they choose to implement. The various apps influenced preschool teachers' level of communication with children differently.

Furthermore, Edwards (2019); Ringsdorf (2022) study confirmed, that in digital play, technological experiences are incorporated into various play activities rather than being kept apart from play, as is typical when technologies are thought of as instruments for gaining access to information or exchanging ideas. The expanded definition of digital play means that, far from being a sedentary activity, it can involve a variety of active activities that can be done outside.

Moreover, according to the study of Disney et al. (2019); Whitton & Moseley (2021) that children who played with various digital resources at home and in their preschool could master operational characteristics, broaden their knowledge and awareness of the world, and assist the growth of positive dispositions like perseverance and independence. On the other hand, if digital technologies were used as multipurpose tools interwoven with other activities, novel forms of play and learning would occur in learning environments where children could access them.

10.2 Post-Test Score of Kindergarten Learners in Reading and Counting

The post-test score of kindergarten learners in reading and counting after the utilization of digital play-based learning package was high. A high post-test score in reading and counting after the utilization of a digital play-based learning package can suggest that the student has made significant progress in these areas. The use of digital play-based learning packages can provide a fun and engaging way for students to practice and develop their skills in reading and math, while also incorporating elements of play that can help to motivate and engage students. The use of digital platforms can also allow for personalized learning experiences that can adapt to the needs and learning styles of individual students. A high post-test score can indicate that the student has benefited from these interactive and personalized learning experiences, and has made significant progress in their reading and counting abilities.

The result of the study is confirmed by Neumann & Neumann (2017) who claims that play-based program should contain a daily schedule for exercise inside and outside, including music, movement, creative expression, and adult-child interactions that serve as role models for moderate to strenuous activity levels. A sizable percentage of kids are exposed to digital games that can enhance learning in a world that improves language education. Only some people experience this due to the widening digital divide. Youngsters in South Africa limited access to data and digital gadgets. Leung et al. (2020) this factual study examined how educators perceive and employ digital play. The child is an expert in his own digital game, where he is knowledgeable. Their apparent disparities are at play in their social environment.

Moreover, Bauer et al. (2017); Syam (2022) study concluded that digital play in an online playground entail developing a delightful virtual world with multiple learners closes to the resource and making an effort to engage in some, even if not directly directing the technology. It is anticipated that such an encounter will trigger a wide range of social behaviors shaping how learners use technology. There is a digital divide in South Africa, where things are more difficult due to due, among other things, poverty's restraints. The ability to use computers and data. Additionally, it is irrelevant where or how learners' study; they can do so by using authentic items, playing online games, or working alone or in a group.

10.3 Effectiveness of Digital Play-Based Supplementary Learning Packs

Data revealed that here was a significant difference in the pre-test and post-test scores of kindergarten learners. It means that the Digital Play-Based Supplementary Learning Packs improved the reading and counting skills of kindergarten learners. This assumption parallels the study of Howard et al. (2017), who claims that preschool teachers' intentions with the pedagogical use of digital play are essential for children's learning outcomes. Preschool teachers must properly introduce and implement digital technologies if the user becomes a lever for children's learning. Likewise, digitalization has small but positive effects on learning in general. Still, the positive outcomes can be improved if digital technologies are implemented as a part of education and with clear goals. Experts support that preschool teachers' organizing digital play activities will also have implications for their educational potential.

Furthermore, Flewitt et al. (2016); Kainulainen (2019), teaching with mobile technologies needs to be done authentically, enabling personalized learning and collaboration opportunities. Digital customization is a collection of techniques, items, and procedures that can be applied in various ways and for multiple objectives in the preschool learning setting. It is also vital for preschool teachers to participate in the kids' digital play.

11. Conclusion

Based on the data collected, the following conclusions were established: First, the Pre-test mean gain score of the subjects was low before the treatment. Second, the Post-test mean gain score obtained by the subjects was high after treating them with Digital Play-Based Supplementary Learning Packs. Lastly, there was a significant difference in the pre-test and post-test scores of kindergarten learners. It means that the Digital Play-Based Supplementary Learning Packs improved the reading and counting skills of kindergarten learners.

11.1 Recommendation

Based on the results of the study, which found a significant difference between the pre-test and post-test scores of kindergarten learners after using digital play-based supplementary learning packs, the following recommendations can be made:

For the global community, this study highlights the potential benefits of incorporating digital play-based learning materials in early childhood education. With the increasing availability and accessibility of technology, it is important to explore innovative and engaging ways to enhance learning outcomes for young learners.

For the Department of Education, this study suggests the value of integrating digital play-based learning materials into the curriculum for kindergarten learners. Educators can utilize the findings of this study to support evidence-based decision-making in designing and implementing effective instructional strategies that meet the learning needs of young children.

For teachers, this study provides insights into the effectiveness of digital play-based learning materials as supplementary resources for enhancing the reading and counting skills of kindergarten learners. Teachers can consider incorporating these materials into their teaching practices to provide engaging and interactive learning experiences for their students.

For learners, this study offers an opportunity to learn and practice foundational skills through a fun and interactive platform. Learners can benefit from the use of digital play-based learning materials as a supplement to classroom instruction, allowing them to develop and reinforce their reading and counting skills in an enjoyable and engaging way.

For future researchers, this study provides a foundation for further exploration of the use of digital play-based learning materials in early childhood education. Future studies can build upon these findings to investigate the effectiveness of other digital learning tools and strategies, as well as explore the impact of these interventions on other learning domains and in different contexts.

Conflict of Interest Statement

The authors declare no conflicts of interest

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