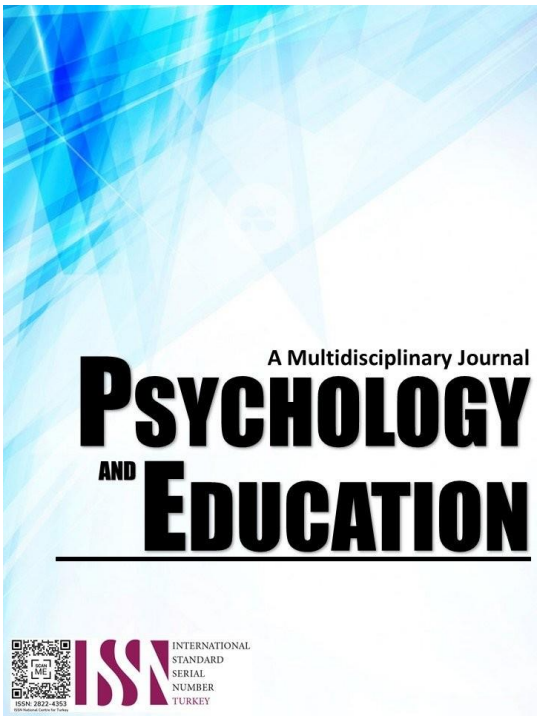
STIMULATING PEDAGOGICAL APPROACH FOR REINFORCING KINDERGARTEN SKILLS (SPARKS) ON LITERACY DEVELOPMENT: A COMPENDIUM OF INTERACTIVE LEARNING RESOURCES



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Research Article

Stimulating Pedagogical Approach for Reinforcing Kindergarten Skills (SPARKS) on Literacy Development: A Compendium of Interactive Learning Resources

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Abstract

Teaching kindergarten learners required a lot of effort and strategies to ensure that they were able to gauge the lessons being imparted, especially literacy skills that they could utilize in dealing with life. Incorporating the SPARKS innovation was believed to have a positive impact on learners' learning. In this study, eight (8) kindergarten teachers and ninety-six (96) kindergarten learners served as respondents. The teachers completed a questionnaire that provided information about the respondents' demographic profile, their perceptions of the importance of external factors on the literacy skills of kindergarten learners, and their preferred digital resources for conducting classes. Meanwhile, the learners answered a pre-test and then underwent a series of sessions that integrated the SPARKS intervention. Afterwards, they completed a post-test to assess the effectiveness of the intervention in teaching using digital resources. Data gathered indicated that the teacher respondents who utilized digital resources gained a better understanding and learning on the part of the learners. Additionally, the results showed that the integration of SPARKS and digital resources helped increase the learning ability of the learners since they were more involved and exposed to the learning process. Based on the findings of the study, it was believed that the inclusion of the SPARKS intervention in the classes of kindergarten learners contributed to the enhancement and development of literacy skills. Moreover, it was concluded that the external factors mentioned served as very important influences that greatly impacted the literacy skills of learners. It was recommended that school administration utilize the SPARKS intervention in other grade levels to employ the technique in classes and to assess whether the intervention was also effective, as well as to present the intervention to other schools for utilization.

Keywords: *SPARKS, digital resources, literacy skills, technology integration, kindergarten*

Introduction

In an era where digital technology rapidly transformed educational landscapes, the integration of online learning tools became increasingly essential, particularly for early childhood education. According to Krogh and Morehouse (2020), technology could be seamlessly integrated as an educational tool when suitable. However, when children were involved in investigative learning, technology could be introduced in a way that enhanced their learning experience, making it a valuable tool rather than a standalone subject. Kalyansagar (2024) presented insights from a case study at Apple Tree Kindergarten in Bangkok, Thailand, where Academic Director Ms. Sophie Wilson seamlessly integrated digital tools into daily learning. Technology was viewed as a valuable tool rather than a standalone subject, fostering curiosity, imagination, and responsible learning. Ms. Sophie emphasized the importance of responsibility in using technology, with each classroom equipped with a designated tablet and educators guiding discussions on screen time limits and healthy digital habits. This approach highlighted the kindergarten's commitment to using technology for exploration, creativity, and digital literacy, nurturing children's curiosity and imagination in a technologically enriched environment.

On the other hand, there were some online learning tools used to enhance educational technology and support interactive learning environments. An online learning tool referred to any software, website, or app accessible through the internet, designed to improve teaching and learning experiences (Brenner, 2023). These digital resources aided educators and learners in instruction, academic growth, and communication. Using online tools for instruction offered numerous advantages, especially in molding literacy skills. Ansaldi (2022) emphasized 10 online tools, including Quizlet, a tool for creating flashcards and quizzes, and Kahoot, which offered interactive game-based learning experiences. Various online learning tools catered to different educational needs, such as WordSalad, which enabled the creation of visually appealing word clouds, while StoryBird facilitated the development of creative writing skills through storybook creation. Additionally, Kids A-Z/Raz-Kids provided access to leveled eBooks and eQuizzes, aiding in personalized reading practice, while Education.com offered a wide range of educational resources for young learners. Furthermore, ClassDojo fostered communication between students, teachers, and parents, enhancing the virtual classroom experience. Spelling Stage made spelling practice engaging, and Epic offered a vast library of children's books. Hungry Caterpillar Play School assisted in preparing preschoolers for school with realistic 3D details in colors and shapes, numbers, and the alphabet, along with book reading, puzzles, and arts. Learn English Kids was a website designed to help parents whose children were unable to attend school, allowing young children to practice English at home. By incorporating online tools into their teaching environments, educators aimed to foster a more favorable learning environment for students. These tools shifted the focus toward student-centered learning, empowering students to actively engage in creating content rather than passively receiving information.

While technology may have affected the pedagogical approach, Montclair State University (n.d.) stated that pedagogy referred to the involvement of methods that teachers used to educate students, based on a specific curriculum and clear goals. Its purpose was to use effective teaching strategies to help students understand and achieve their learning objectives. Woode-Eshun et al. (2023) referenced

Mumpuniarti (2017), who highlighted that many countries had adopted various educational plans and pedagogical practices to improve literacy skills, especially in early childhood education levels. Additionally, Montclair State University (n.d.) noted that language and literacy were essential for developing literacy skills. Learning to communicate through gestures, sounds, and words boosted a child's interest in understanding reading books. However, the SPARKS platform represented an innovative attempt to connect these technological advancements to enhance literacy skills among kindergarten students through interactive and engaging pedagogical methods. Contrary to the study of Dorji (2023), which underscored the assertion made by Brown (2016) that the traditional approach of reading and articulating sentences and words to learners lacked real-world applicability, Brown advocated for using social media platforms to immerse learners in authentic language contexts. This approach helped communication with native speakers, thereby fostering language acquisition and skill development (Dorji, 2023; Brown, 2016). Despite its adaptability and alignment with universal design for learning principles, addressing challenges like teacher training and material availability was essential for successful implementation. Thus, this thesis aimed to investigate the effectiveness of SPARKS in creating a stimulating learning environment that not only reinforced foundational literacy skills but also ignited a passion for reading and writing in young learners.

The findings of this study significantly impacted various key beneficiaries by enhancing early childhood literacy through the "SPARKS" program. First, kindergarten learners benefited directly from improved literacy skills and increased engagement, which prepared them better for future academic challenges. Next, the researcher gained valuable experience in conducting quantitative research and contributed to the understanding of educational methods. Furthermore, future researchers found a solid foundation for further studies in early childhood education and digital literacy, with insights and data that informed their work. Overall, this study provided important information to the academic community, guided policymakers in developing effective literacy policies, and helped educators improve teaching strategies and resource allocation. Additionally, it supported community development by addressing literacy challenges and promoted the use of digital tools, which encouraged investments in educational technology while also contributing to sustainable practices by reducing reliance on physical resources.

Research Questions

This research aims to determine the effectiveness of "SAPRKS" on the literacy skills of Kindergarten II learners at Watkubon School in Bangkok City, for the school year 2023-2024, as basis for a digitized interactive learning resources for kindergarteners. Specifically, this study sought to answer the following sub-questions:

1. What is the demographic profile of the kindergarten teachers in terms of:
    1.1. age;
    1.2. gender;
    1.3. ethnicity;
    1.4. education;
    1.5. number of years in teaching; and
    1.6. relevant training?
2. What are the literacy skills of the kindergarten learners before and after the intervention of the SPARKS in terms of:
    2.1. letter recognition;
    2.2. sight words, and
    2.3. writing skills?
3. Did the literacy skills improve after the SPARKS intervention in terms of:
    3.1. letter recognition;
    3.2. sight words; and
    3.3. writing skills?
4. How do the teachers perceive the relevance of the following to the learners' literacy skills?
    4.1. Attitude towards digital tools;
    4.2. Family support for digital learning;
    4.3. School support for digital integration;
    4.4. Teachers' competency with digital tools; and
    4.5. Access to digital resources?
5. Based on the findings, what digitized interactive learning resources can be designed?

Methodology

Research Design

This study employed a quantitative research approach, utilizing a pre-experimental design to explore the impact of the SPARKS intervention on kindergarten learners' literacy skills. The pre-experimental design involved administering pre-tests and post-tests to assess changes in learners' abilities in letter recognition, sight words, and writing skills. Additionally, demographic data from kindergarten teachers—including age, gender, ethnicity, education, years of teaching experience, and relevant training—was collected to contextualize the findings. This quantitative approach enabled a systematic examination of the effectiveness of the SPARKS intervention, providing measurable evidence of its impact on early literacy development. Rana et al. (2021) explained that quantitative

methods were used to summarize data, calculate averages, identify patterns, predict outcomes, and explore causal relationships. These methods also allowed researchers to generalize findings to larger populations, quantify effect sizes, evaluate the strength of associations, prioritize factors, and assess the effectiveness of evidence. However, recent literature suggested that the quality of language input was a stronger predictor of early literacy development than the quantity of language exposure (Law et al., 2017). Notably, there were few intervention studies in this area. For example, a recent randomized controlled trial involving 142 families with 11-month-old infants found that a book-sharing contingent talk intervention increased caregivers' contingent talk, which in turn supported children's vocabulary growth (McGillion, Pine, Herbert, & Matthews, 2017). Despite this short-term benefit, the effect was not long-lasting, indicating the need for further follow-up interventions (McGillion et al., 2017).

Respondents

The study included a total of 96 participants from Kindergarten Level 2, supported by 8 teachers, consisting of 4 teachers and 4 co-teachers. The participant distribution across the four sections was as follows: Section 1 had 24 participants, Section 2 also had 24 participants, Section 3 had 23 participants, and Section 4 had 25 participants. Each section was staffed with 2 educators, comprising 1 teacher and 1 co-teacher, contributing to a total of 8 teachers across all sections.

The inclusion criteria for this study required participants to be enrolled in Kindergarten 2 and assigned to one of the four designated sections (Section 1, Section 2, Section 3, or Section 4). Additionally, students needed to have regular attendance, with a minimum attendance rate of 90% throughout the study period. Approval for participation was secured through a formal consent letter authorized by the school director, ensuring that all participants were authorized to engage in the study. Students were also required to have basic proficiency in the language of instruction to fully engage with the assessments. Furthermore, the study included Kindergarten 2 teachers and co-teachers who were responsible for the students in the specified sections, ensuring consistent implementation of the intervention and reliable data collection. Conversely, students not enrolled in Kindergarten 2, those not assigned to the specified sections, or those with irregular attendance were excluded. The study also excluded students whose participation required special educational accommodation beyond the scope of the study, ensuring consistency and reliability in the intervention and data collection processes.

Note. Each section was staffed with one teacher and one co-teacher.

Instrument

The research tool was designed to assess the effectiveness of the SPARKS intervention on Kindergarten 2 students' literacy skills. This tool featured pre-test and post-test assessments focusing on letter recognition, sight word recognition, and writing skills. Each assessment consisted of 3 items for letter recognition, 3 items for sight word recognition, and 4 items for writing skills, including writing and matching for letter recognition and sight words, as well as evaluations of writing skills. The pre-test was administered in a controlled environment to establish baseline measurements before the intervention began. Following the pre-test, the 10-day SPARKS intervention incorporated targeted activities such as interactive digital flashcards, phonics games, digital storybooks, CVC word spelling, and writing practice on iPads to enhance literacy skills. After the intervention, the post-test was conducted to measure improvements in the same areas evaluated by the pre-test.

Additionally, the research questionnaire underwent testing to determine its content validity and reliability. This questionnaire aimed to collect demographic information about the kindergarten teachers, including their age, gender, ethnicity, education, number of years in teaching, and relevant training. The reliability of the research tool was ensured by maintaining consistency between the pre-test and post-test conditions and adhering to rigorous standards in test administration. Validity was supported through expert review for content validity and alignment with established benchmarks for construct validity. Data collected from both tests and the questionnaire were systematically organized and analyzed using appropriate statistical methods. Results were presented in tables and interpreted in the context of relevant literature. All raw data were securely stored and purged after the study to maintain confidentiality and data integrity. This comprehensive approach ensured an accurate evaluation of the SPARKS intervention’s impact on literacy skills.

The names of participants were not used for reporting; instead, researchers were referred to by their student number, based on the class list.

Procedure

Pre-data Gathering. To initiate the research project, approval from the School of Watkubon was necessary, along with endorsement from a panel member. Following this, the researcher adhered to the compliance checklist and submitted it to UV-IRB for technical and ethical review to obtain the Notice to Proceed. Upon receiving authorization and the Notice to Proceed Certification from the Ethics Committee, ethical approval was obtained, and consent was secured from the school board and teachers. The researcher then conducted surveys for teachers and kindergarten learners on how to administer the digital literacy tools to ensure consistency before commencing with data collection using the approved research instrument.

Actual Gathering of Data. Upon receiving the Notice to Proceed Certificate from the Research Ethics Committee of the University of the Visayas Institutional Review Board, the research commenced data collection. The primary participants were kindergarten students from Watkubon School, specifically from Kindergarten 2. Data collection occurred at two points: pre-intervention, to establish baseline skills, and post-intervention, to assess skills following the intervention. Demographic information, including age, gender, ethnicity,

education, years of teaching experience, relevant training, and kindergarten level, was also gathered.

At the same time, in the teacher survey component, efforts were made to accommodate respondents' schedules, allowing them to complete the survey at their convenience. The survey was administered beyond the educational institution premises, provided respondents met the inclusion criteria outlined in the research. Face-to-face surveys were conducted to ensure ease and accessibility for participants. Additionally, participants were presented with an informed consent form as part of the ethical procedure, and only those who signed the form were considered fully enrolled in the study.

The 10-day intervention plan included targeted activities focusing on letter recognition, sight words, and writing skills. During the first three days, activities such as interactive digital flashcards (accessible at this Google Drive link), an interactive phonics game for beginning sounds, and the "Find the CVC Word" interactive game (accessible at this Twinkl link) were used to enhance letter recognition. The next three days involved engaging students with digital storybooks, CVC word spelling activities, and "Color Words on Balloons" flashcards (accessible at this Google Drive link) to improve sight word recognition. The final four days focused on writing skills through digital tracing activities on iPads (Pencil Control Activity) and writing practice on iPads (letters, numbers, and shapes tracing activity), accessible at this Google Drive link. Each phase was assessed with pre- and post-intervention tests to measure progress. This structured approach ensured that the intervention was comprehensive and effectively addressed key areas of literacy development.

Post-data Gathering. After conducting the pre-test, the researcher proceeded with the 10-day intervention, followed by administering the post-test to the kindergarten students. The data collected from these pre- and post-tests were organized and tabulated, consistent with the pre-experimental design of the study. Statistical analysis was then applied to the quantitative data using the appropriate formulas specified in the research. The results were presented in tables, with interpretations drawn into consideration of relevant literature and the study's broader implications. Finally, all raw data were securely purged after the study to ensure confidentiality and data security.

Data Analysis

To assist in the examination of the data for this research, the following tools were employed: A pre-experimental design was used, involving the administration of pre-tests and post-tests to measure changes in kindergarten learners' literacy skills, specifically in letter recognition, sight words, and writing skills. This design facilitated the analysis of differences between pre-test and post-test scores, allowing for an assessment of the SPARKS intervention's effectiveness. Observations and preliminary findings were presented based on the analysis, highlighting key trends and patterns. Additionally, means and standard deviations were computed, and inferential statistics (T-tests and paired samples) were applied to analyze the demographic data and improvements after the SPARKS intervention collected from kindergarten teachers, providing context for the study's findings. The analysis included the identification of the lowest and highest scores from both the pre-test and post-test, offering insight into the range of improvement among participants. Analysis was also utilized to explore potential relationships between teachers' demographic characteristics and the effectiveness of the intervention. Finally, the results were interpreted in relation to relevant literature, providing a comprehensive understanding of the SPARKS intervention's impact on early literacy development.

Ethical Considerations

This study adhered to rigorous ethical standards to ensure the protection and respect of all participants. Informed consent was obtained from all participants, including parents or guardians, prior to their involvement. Confidentiality was maintained by anonymizing data and securely storing all information. Participants' rights and well-being were prioritized, and the research was conducted with transparency and integrity. All procedures complied with institutional guidelines and ethical research practices.

Beneficence. Beneficence imposed a duty on researchers to minimize harm and maximize benefits. Human research was intended to produce benefits for participants or, in a more common situation, for others.

Respect. Respect for human dignity was the second ethical principle in the Belmont Report. This principle included the right to self-determination and the right to full disclosure.

Justice. The third broad principle articulated in the Belmont Report concerned justice, which included participants' right to fair treatment and their right to privacy.

Content, Comprehension and Documentation of Informed Consent

Participants Status. Participants were informed about the distinction between research and treatment, which activities were routine, and how their data would be used for research. Only Kindergarten 2 students in Sections 1–4 with at least 90% attendance were included, with parental consent obtained. Participants needed basic language proficiency, while those requiring special accommodations or having irregular attendance were excluded. Only Kindergarten 2 teachers from the designated sections were involved. These criteria ensured appropriate selection and meaningful participation.

Study Goals. The research goals were stated in simple terms, avoiding technical language. Participants were informed about how their data would be used.

Type of Data. This study used a quantitative research approach with a pre-experimental design to assess the impact of the SPARKS intervention on kindergarten learners' literacy skills. It involved administering pre-tests and post-tests to evaluate changes in letter recognition, sight words, and writing skills. Participants were informed that the data collected was quantitative.

Procedures. Prospective participants were informed about the data collection procedures and treatment methods. Approval was obtained from the School of Watkubon and the UV-IRB before starting the research. Data collection occurred with Kindergarten 2 students at two points: pre-intervention and post-intervention. A 10-day intervention plan focused on letter recognition, sight words, and writing skills. After the post-test, data were analyzed, and all raw data were securely purged to ensure confidentiality.

Nature of Commitment. Participants were informed about the time commitment required for each contact point and the total number of contacts during the study. This included the duration of the 10-day intervention and the time for pre- and post-assessments.

Sponsorship. Participants were informed about who sponsored or funded the study, including whether it was part of an academic requirement. This transparency ensured participants understood the context of the research and any potential influences on the study.

Participant Selection: Prospective participants were informed about the selection process for recruitment, including the criteria used for eligibility and how many individuals would be participating in the study. This information provided clarity on how participants were chosen and helped ensure transparency throughout the research process.

Potential Risk: Prospective participants were informed about any foreseeable risks (physical, psychological, social, or economic) and the discomforts associated with the study, along with the measures taken to minimize these risks. They were also made aware of the possibility of unforeseeable risks and, if applicable, informed about treatments available in case of injury or damage. If the risks were deemed more than minimal, participants were encouraged to seek advice before giving their consent.

Benefits: Participants benefited from access to the SPARKS intervention, which contributed to their development through a compendium of interactive learning resources.

Potential Benefits. Other possible benefits

Incentives and Compensation: Participants were informed about any stipends or reimbursements provided for their involvement in the study. They were made aware of whether the compensation was monetary or not. If compensation was not monetary, alternative options for giving back to participants were discussed. These arrangements ensured transparency regarding any incentives offered for participation.

Confidentiality Pledge: Prospective participants were assured that their privacy would always be protected throughout the study. They were informed that any data collected would be kept confidential. This confidentiality pledge ensured that participants felt secure in sharing their information.

Confidentiality Procedure. Participants were assured that their information would not be shared with others unless they gave explicit permission. The researcher took steps to protect confidentiality, including obtaining identifying information only when necessary, assigning ID numbers to participants, storing data securely, and reporting findings in aggregate form to maintain anonymity.

Authorization to Access Private Information. The authorization to access private information was integrated within the consent form, specifying who would receive access to participants' information. Participation in the study was entirely voluntary, with no penalties or loss of benefits for those who chose not to participate. Additionally, participants retained the right to withdraw from the study at any time or withhold specific information, with researchers outlining any conditions under which they might need to end the study on participants' behalf.

Contact Information. The researcher informed participants whom they could contact for further questions, comments, or complaints. The UV-IRB Ethics Review Panel approved the study and was available for concerns about participants' rights, grievances, or complaints. Contact information was provided to ensure accessibility and transparency.

Debriefing, Communications and Referrals. The researcher showed respect and minimized emotional risks by interacting graciously and being sensitive to cultural and linguistic diversity. A debriefing session was offered after data collection, especially if the process was stressful or involved minor ethical adjustments. Participants were thanked for their involvement, and follow-ups were conducted when appropriate. If needed, referrals to relevant health, social, or psychological services were provided.

Conflict of Interest. A conflict of interest arose when financial or personal factors could compromise the researcher's objectivity. This included both apparent and potential conflicts that might lead to bias. It indicated the possibility of influence, not actual misconduct, which involved fabrication, falsification, or plagiarism. For IRB approval, a statement acknowledging and managing conflicts was submitted.

Treatment of Vulnerability Groups. The researcher took special ethical precautions when working with vulnerable participants, such as those unable to give fully informed consent or at risk of unintended side effects. Studies involving high-risk groups were conducted only when the risk was minimal or no alternatives existed. For child participants, consent was obtained from a parent or guardian, and assent was sought from children aged 7 and older. Older children, around age 12, provided written assent to respect their autonomy.

The researcher followed ethical guidelines, including those by Lindeke (2000), Kanner (2004), and Subpart D of the Code of Federal Regulations (2005).

Results and Discussion

Demographic Profile of the Teacher-Respondents

Table 1 presented the demographic profile of the teacher-respondents, showing the frequency and percentage distribution for each category.

Table 1. *Demographic Profile of the Teacher-Respondents: Frequency and Percentage Distribution*

Category	*Frequency (n)*	*Percentage (%)*
Age		
Under 25 years old	0	0%
25–34 years old	2	25%
35–44 years old	4	50%
45–54 years old	1	12%
55 years old and over	1	13%
Total	8	100%
Gender		
Male	0	0%
Female	8	100%
Total	8	100%
Ethnicity		
Thai	7	87%
Non-Thai	1	13%
Total	8	100%
Years of Teaching Experience		
0–1 year	0	0%
2–4 years	1	12%
5–9 years	2	25%
10–14 years	3	38%
15+ years	2	25%
Total	8	100%
Relevant Training		
Early Childhood Education Certification	3	25%
Phonics Instruction Workshops	0	0%
Literacy Development Courses	3	25%
Technology Integration Training	3	25%
No Additional Training	3	25%
Total	8	100%
Education		
Bachelor's Degree	8	100%
Master's Degree	0	0%
Doctorate Degree	0	0%
Total	8	100%

The demographic profile of the teacher-respondents provided a comprehensive overview of their key characteristics, including age, gender, ethnicity, educational attainment, years of teaching experience, and relevant training. As shown in Table 1, half (50%) of the respondents belonged to the 35–44 age group, followed by 25% in the 25–34 age group. The 45–54 and 55 years old and over brackets each had one respondent, representing 12% and 13%, respectively, while no respondents were under 25 years old. In terms of gender, all eight respondents (100%) were female, which aligned with the prevalent trend in Thailand, where early childhood education was predominantly taught by women due to cultural beliefs about their nurturing abilities. Regarding ethnicity, 87% of the respondents were Thai, while the remaining 13% belonged to a different ethnic background. All teacher-respondents hold a bachelor's degree in Education, indicating a foundational level of professional qualification. In terms of teaching experience, the majority (38%) had 10–14 years of experience, followed by 25% with 5–9 years and another 25% with 15+ years. Only 12% had 2–4 years of experience, and none had less than two years of teaching experience. Regarding relevant training, respondents were allowed to select multiple responses, revealing that 25% had undergone training in Early Childhood Education, Technology Integration, and Literacy Development, while another 25% indicated they had no additional training. Notably, none of the respondents had participated in Phonics Instruction Workshops, possibly because phonics instruction was already a routine component of their teaching practices. Overall, these demographic characteristics provided insights into the qualifications, experience, and professional development of the respondents, which were essential in understanding their preparedness and competencies in the field of early childhood education.

Literacy Skills of Kindergarten Learners Before and After the Intervention

Table 2 is the presentation of literacy skills of kindergarten learners, focusing on three critical areas: Letter Recognition, Sight Word Recognition, and Writing Skills. The effectiveness of this intervention was assessed by comparing pretest and posttest scores, with data collected from a sample size of N=96 for all categories.

Respondents presented the literacy skills in terms of Letter Recognition. The pretest total score increased from 267 to 281 in the posttest, with the mean score rising from 2.78 to 2.93. This improvement was accompanied by a decrease in standard deviation from 0.37 to 0.17, indicating that learners not only improved but also demonstrated more consistent performance in letter recognition after the intervention. Next, for Sight Word Recognition, the total score improved from 255 to 279 following the intervention. The mean score increased from 2.65 to 2.91, reflecting enhanced word identification skills among learners. The standard deviation also decreased from 0.61 to 0.22, suggesting that students showed a more uniform level of improvement in their sight word recognition abilities. Regarding the Writing Skills of the kindergarten learners, the pretest total score of 197 increased to 276 in the posttest. The mean score rose significantly from 2.06 to 2.88, indicating substantial growth in writing proficiency. The standard deviation decreased from 0.91 to 0.29, further demonstrating improved consistency in writing skills among the students after the intervention.

Table 2. *Literacy Skills of Kindergarten Learners Before and After the Intervention*

Skill Area	*Pretest Total Score*	*Posttest Total Score*	*Pretest Mean (M)*	*Posttest Mean (M)*	*Pretest SD*	*Posttest SD*
Letter Recognition	267	281	2.78	2.93	0.37	0.17
Sight Word Recognition	255	279	2.65	2s.91	0.61	0.22
Writing Skills	197	276	2.06	2.88	0.91	0.29

Note. Higher scores indicate improved literacy skills. M = Mean; SD = Standard Deviation. N = 96 for each skill area.

Subsequently, each score reveals a deeper improvement in the literacy skills assessed, particularly highlighting the enhancement in Letter Recognition, where the increase in the mean score and reduced variability among learners underscores the effectiveness of the intervention. Similarly, the improvements in Sight Word Recognition emphasize the significant rise in the mean score and the more consistent performance across the cohort. In Writing Skills, the mean score saw a substantial increase, supported by a decrease in standard deviation, illustrating the SPARKS intervention's effectiveness in enhancing writing proficiency. This suggests that the implementation of SPARKS in classroom settings, along with the integration of various educational resources, contributes positively to the enhancement of students' literacy skills. Furthermore, it indicates that with the utilization of SPARKS, students tend to be more active and engaged in the different classroom activities presented. These results contradict the findings of Mustafa (2023), who stated that parents, teachers, and students were not prepared for digital learning, resulting in a collectively negative impact on kindergarten education. He also noted that more effort needs to be invested in the future, including providing digital devices to both teachers and parents, ensuring accessible and free internet for all, and introducing television and web-based programs with activities designed to help kindergarten students learn at home.

This finding was clearly supported by Age of Learning, Inc. (n.d.), which discussed that incorporating digital sight word games focused on teaching young children high-frequency words—those that appeared most often in text. While sight words should have initially been taught phonetically, children ultimately learned to recognize them by sight, allowing them to concentrate on reading comprehension and sounding out unfamiliar words. Digital sight word games typically adopted an interactive approach to facilitate this learning process. Furthermore, the article emphasized that by integrating elements of play into the study of sight words, children were more likely to remain motivated and engaged with the learning material. This approach also provided immediate feedback, which was a crucial component of the learning experience. When children selected the correct word, positive reinforcement from the game encouraged them to continue, boosting their confidence and leading them to play—and learn—more. In addition, Gibbon et al. (2017) stated that sight word intervention games in remedial reading programs were highly effective for improving sight word achievement among first-grade students. The findings of their study indicated that sight word games were highly engaging and created an environment conducive to active learning, motivating students to participate. However, the results also suggested that while intervention games had a direct impact on student engagement, they did not necessarily affect a student's self-concept as a reader.

In summary, the data indicated that the SPARKS intervention had been successful in significantly improving the literacy skills of kindergarten learners across all assessed areas. The increases in pretest and posttest scores, along with the shifts in mean and standard deviation, underscored the positive impact of targeted instructional strategies on developing essential literacy skills among young learners. This improvement highlighted the effectiveness of the SPARKS intervention in enhancing letter recognition, sight word recognition, and writing skills, suggesting that engaging, interactive approaches could foster a conducive learning environment for early literacy development. The findings supported the notion that digital tools and structured activities could play a crucial role in motivating students and improving their performance, ultimately contributing to their overall educational success.

Improvement of Literacy Skills after the SPARKS intervention

Paired samples t-test was used to test effectiveness of SPARKS to improves the literacy skills of the kindergarten in terms of letter recognition, sight words and writing skills. It was use to determine if there is significant improvement in the performance of the kindergarten learners before and after the use of SPARK intervention.

Table 3. *Hypothesis 1: Letter Recognition Skill*

Null Hypothesis (H_0)	*Alternative Hypothesis (H_1)*	*Level of Significance*	*Degrees of Freedom (df)*	*t Critical one-tail*	*Statistics*	*Decision Rule*
There is no significant improvement in letter recognition skills before and after the SPARKS intervention.	There is a significant improvement in letter recognition skills after the SPARKS intervention.	α=0.05	df=n-1=96-1=95	1.66	t-Test: Paired Two Sample for Means	If the t-computed value is greater than or beyond the critical value, reject H0

The t-computed value of 2.32 is beyond the critical value of 1.66 at 0.05 level of significance with 95 degrees of freedom, the null hypothesis is therefore rejected in favor to research hypothesis. This means that the post test result is higher than the pretest

Table 4. *Hypothesis 2: Sight Words Skill*

Null Hypothesis (H_0)	*Alternative Hypothesis (H_1)*	*Level of Significance*	*Degrees of Freedom (df)*	*t Critical one-tail*	*Statistics*	*Decision Rule*
There is no significant improvement in letter recognition skills before and after the SPARKS intervention.	There is a significant improvement in letter recognition skills after the SPARKS intervention.	α=0.05	df=n-1=96-1=95	1.66	t-Test: Paired Two Sample for Means	If the t-computed value is greater than or beyond the critical value, reject H0

The t-computed value of 2.94 is beyond the critical value of 1.66 at 0.05 level of significance with 95 degrees of freedom, the null hypothesis is therefore rejected in favor to research hypothesis. This means that the post test result is higher than the pretest result. It implies that there is enough evidence that shows that the use of SPARK intervention is effective to improve sights word skill.

Table 5. *Hypothesis 3: Writing Skill*

Null Hypothesis (H_0)	*Alternative Hypothesis (H_1)*	*Level of Significance*	*Degrees of Freedom (df)*	*t Critical one-tail*	*Statistics*	*Decision Rule*
Null Hypothesis (H_0): There is no significant improvement in writing skills before and after the SPARKS intervention.	There is a significant improvement in writing skills after the SPARKS intervention.	α=0.05	df=n-1=96-1=95	1.66	t-Test: Paired Two Sample for Means	If the t-computed value is greater than or beyond the critical value, reject H0

The t-computed value of 6.89 is beyond the critical value of 1.66 at 0.05 level of significance with 95 degrees of freedom, the null hypothesis is therefore rejected in favor to research hypothesis. This means that the post test result is higher than the pretest result. It implies that there is enough evidence that the use of SPARK intervention is effective to improve writing skill.

Based on the results of the paired t-test, it can be concluded that the use of the SPARKS intervention significantly improved letter recognition, sight word recognition, and writing skills among Kindergarten learners.

Teachers' Perceptions of Factors That Influenced Learners' Literacy Skills

Table 6 presented the perceptions of teachers regarding the relevance of various factors in shaping learners' literacy skills in a digital learning environment.

Table 6 presented the perceptions of the teacher-respondents regarding the level of importance of various external factors in relation to the literacy skills of kindergarten learners. All the external factors mentioned were perceived as very important by the teacher-respondents. Among all the factors used in this study, Attitude and School Support received the highest weighted mean of 3.75 each, which was interpreted as “Very Important.” These were followed by the factors Competency and Access, both with a weighted mean of 3.375, also interpreted as “Very Important.” The factor that garnered the lowest weighted mean was Family Support, with a score of 3.25, yet it was still interpreted as “Very Important.”

It could be derived from the results of the study that all the mentioned factors were important in enhancing the learners’ literacy skills. The only aspect that distinguished each factor in terms of importance was the degree of emphasis placed on them. The reason Attitude and School Support received the highest mean scores was that throughout the academic time spent by the students, they remained in school, which provided them with the necessary learning opportunities to enhance their skills. In terms of attitude, it primarily focused on how the learners reacted and participated in the learning process. When learners responded positively and actively participated, a positive impact on their skill development manifested. Conversely, if learners were merely passive participants in the learning process, a negative or negligible impact on their performance could be observed.

Table 6. *Teachers' Perception on the Relevance of the Factors to Learners' Literacy Skills*

Section	Teacher/ Co-Teacher	Attitude	Interpretation	Family Support	Interpretation	School Support	Interpretation	Competency	Interpretation	Access	Interpretation
Section 1	Teacher 1	4	Very Important	3	Important	4	Very Important	3	Important	3	Important
	Co-Teacher 1	4	Very Important	2	Somewhat Important	4	Very Important	4	Very Important	4	Very Important
Section 2	Teacher 2	4	Very Important	3	Important	4	Very Important	3	Important	4	Very Important
	Co-Teacher 2	4	Very Important	4	Very Important	4	Very Important	4	Very Important	4	Very Important
Section 3	Teacher 3	4	Very Important	4	Very Important	4	Very Important	4	Very Important	3	Important
	Co-Teacher 3	4	Very Important	4	Very Important	4	Very Important	3	Important	3	Important
Section 4	Teacher 4	3	Important	3	Important	3	Important	3	Important	3	Important
	Co-Teacher 4	3	Important	3	Important	3	Important	3	Important	3	Important
Weighted Mean		3.75	Very Important	3.25	Very Important	3.75	Very Important	3.375	Very Important	3.375	Very Important

Legend: 1.00-174 - Not Important; 1.75-2.49 - Somewhat Important; 2.50-3.24 - Important; 3.25-4.00 - Very Important

It could be derived from the results of the study that all the mentioned factors were important in enhancing the learners' literacy skills. The only aspect that distinguished each factor in terms of importance was the degree of emphasis placed on them. The reason Attitude and School Support received the highest mean scores was that throughout the academic time spent by the students, they remained in school, which provided them with the necessary learning opportunities to enhance their skills. In terms of attitude, it primarily focused on how the learners reacted and participated in the learning process. When learners responded positively and actively participated, a positive impact on their skill development manifested. Conversely, if learners were merely passive participants in the learning process, a negative or negligible impact on their performance could be observed.

Meanwhile, competency and access ranked next to the mentioned factors and are still treated as very important in the skill development of the learners. These factors play a pivotal role in the delivery of the learning targets in the classroom setting. Competency serves as the goals of the session that need to be achieved and developed as the class conducts lessons while Access pertains to the availability of strategies and materials needed in the delivery of the learning episodes.

Lastly, family support came last on the list of factors but still considered as Very Important because this factor caters to the need for continuity of the learning episode even after the school hours. It tackles the assistance provided by family members in connection with the academic concerns of the learner. Provisions on school supplies are not the only support that the learners need from their family. Family support also includes holistic support for the learners where all sorts of assistance are available and given to them so that the learners will be able to successfully finish their studies.

Enhancement of the learners' literacy skills is grounded in their reading abilities. With that in mind, this study is strongly supported by Liu et.al (2022) in their study which states that reading metacognition has a strong influence on reading literacy, with assessing credibility being the strongest predictor, summarizing the second, and understanding and remembering the weakest. Based on the global contribution values calculated for each variable, reading metacognition was found to be an effective predictor, especially assessing credibility and summarizing. Reading metacognition refers to the extent to which the individual knows effective learning strategies (Chunjin, 2020). Learning strategies can be divided into deep learning strategies, which refer to attempts to integrate new information with prior knowledge, and surface learning strategies, which involve repetitive rehearsal and rote memorization of information (Murayama et al., 2013). Furthermore, Liu et.al (2022) also emphasized that home language environment has an impact on students' reading literacy, with dialects having a negative effect on reading literacy; however, proficiency in both a dialect and Mandarin has a positive effect on reading literacy. The results of the study indicate that home language environment has a strong influence on students' reading literacy. It has also been found that dialects negatively influence students' reading literacy. Due to the difference between spoken or written dialects and the official lingua franca, students whose native language is a dialect often make grammatical mistakes and showed poor expressions when learning Mandarin, which can also hinder their written reading and writing (Qin & Zhe, 2020; Yinyin, 2020).

Proposed Digitized Interactive Learning Resources

With careful consideration of the results and observations made during this study, the researcher proposed the use of a compendium of interactive digital learning resources in kindergarten classrooms. This compendium contained instructional materials designed to assist teachers in facilitating effective class discussions and ensuring active participation from learners. By implementing these resources, the goal was to enhance the quality of education and learning experiences for the students.

The proposed output of the study aimed to address the needs of teachers for supplementary materials required in their kindergarten classrooms. This output included various resources focusing on essential communicative language skills to help learners become

effective communicators. It encompassed videos, worksheets, and presentations covering letter recognition, sight word skills, and writing skills. These learning materials were designed to be accessible and usable by teachers, enhancing the interactivity, productivity, and effectiveness of their classes.

Figure 1. *Compendium of Interactive Digital Learning Resources*

The compendium will be regularly updated to ensure it aligns with the evolving demands and trends in strategies and techniques for managing kindergarten classrooms. This ongoing improvement will help guarantee that learners effectively acquire and apply the information presented in class.

Conclusions

This study examined the effects of the SPARKS intervention on the literacy skills of 96 Kindergarten 2 learners, revealing significant improvements in letter recognition, sight word recognition, and writing skills after the intervention. Grounded in Van Dijk's Digital Divide Theory, the study highlights the disparities in digital access and emphasizes the need for equitable learning opportunities through digitized interactive learning resources. The results showed a notable increase in pretest and posttest scores, with the highest t-computed value in writing skills (6.89), indicating the most significant improvement, while the lowest was in letter recognition (2.32), still demonstrating statistically significant enhancement. All computed t-values exceeded the critical value (1.66), leading to the rejection of the null hypothesis in all cases, confirming that the SPARKS intervention significantly improved literacy skills among kindergarten learners. Additionally, teachers identified attitude and school support as the most critical factors influencing literacy skills, suggesting that school-related factors play a crucial role in fostering learning, while family support was considered important but slightly lesser. Based on these findings, a compendium of interactive digital learning resources, including flashcards, phonics games, digital storybooks, and tablet-based activities, was proposed to enhance engagement and effectiveness in literacy instruction. Despite limitations such as sample size and limited access to digital tools, these findings suggest that integrating structured digital learning strategies can significantly enhance early literacy development. Future research should explore the long-term impact of SPARKS, effective strategies to bridge the digital divide in early education, and methods to improve accessibility to digital resources for both teachers and students.

The implementation of the SPARKS intervention in the classes of Kindergarten in Watkubon School demonstrated remarkable effectiveness in developing learners' literacy skills. Based on the results of the tests given to the learners, the initiative successfully enhanced their skills in letter recognition, sight word recognition, and writing skills. Therefore, this study recommended several actions to further support this progress.

For Practice. Kindergarten teachers were encouraged to consider the individual differences and interests of their learners when incorporating various interactive learning resources, as this approach helped ensure higher retention and learning outcomes. Additionally, they were advised to stay updated on the latest digital learning resources to align their materials with current educational trends, which could enhance overall teaching effectiveness.

For Policy. School administration was urged to adopt the SPARKS intervention with minimal modifications to fit the learners' levels, while also assessing its applicability across different grade levels. School directors were encouraged to share the results of this study with other educational institutions, allowing them to evaluate the potential benefits for their students and maximize the intervention's effectiveness throughout the broader educational community.

For Research. Future research was recommended on various topics, including the long-term impact of the SPARKS intervention on

literacy skills in diverse educational settings. Researchers were also encouraged to investigate the effectiveness of SPARKS across different grade levels and subjects beyond literacy, as well as to examine the role of teacher training in the successful implementation of digital learning interventions. Additionally, conducting comparative studies with various sets of respondents could help identify gaps and variations in literacy skill development, while assessing the influence of parental involvement on the effectiveness of the SPARKS intervention in early childhood education could provide valuable insights for future initiatives. By implementing these recommendations, educators, policymakers, and researchers could work together to enhance literacy education and bridge the digital divide in early childhood learning.

Here are the suggested research titles for future researchers:

Long-Term Effects of the SPARKS Intervention on Literacy Development in Early Childhood Education: A Comparative Study Across Different Grade Levels

Exploring the Role of Teacher Training in the Implementation of Digital Learning Interventions: Impact on Literacy Skills in Kindergarten Learners

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