

Effectiveness of Technology Integration in Teaching Kindergarten Learners

Ma. Veronica M. Golla, MAEd

Graduate Student, Tomas Claudio Colleges, Morong, Rizal Philippines

Teacher I, Talaga Elementary School, Morong, Rizal

Publication history: Received: April 12, 2026; Revised: April 16, 2026; Accepted: April 26, 2026

Email of Corresponding Author: maveronica.gola@deped.gov.ph

Abstract

This study determined the effectiveness of technology integration in teaching Kindergarten learners at Talaga Elementary School, Morong, Rizal during School Year 2025–2026. The study utilized a descriptive research method with an experimental two-group design involving 54 Kindergarten learners selected from heterogeneous sections to ensure fair representation. Respondents were described in terms of sex, sibling position, number of children in the family, parents' educational attainment, parents' occupation, and monthly family income. A researcher-made parallel pretest and posttest were administered to measure learners' performance before and after exposure to technology-integrated instruction. Findings revealed that most respondents were male, either youngest or second-born children, with parents who were mostly high school graduates. Fathers were commonly employed in the private sector, while mothers were often working in government institutions, and most families had a monthly income of ₱31,000 and above. The level of performance of both exposed and unexposed groups was generally described as Very Satisfactory. Results showed a significant difference between pretest and posttest scores, indicating improvement in performance after exposure to technology integration. However, no significant difference was found between the exposed and unexposed groups in posttest results. Furthermore, no significant differences were observed in learners' performance when grouped according to sex, number of children in the family, parents' educational attainment, occupation, and family income, except for sibling position, which showed a significant difference. The study concluded that technology integration contributes to learners' academic improvement as shown in the significant pretest and posttest results. However, its effect on posttest performance between groups was not statistically significant, suggesting comparable outcomes regardless of exposure. It also concluded that learners' demographic profile generally does not influence performance, except for sibling position. It is recommended that school heads enhance digital learning resources and facilities, while teachers are encouraged to attend training and seminars on technology integration in early childhood education. The implementation of the proposed action plan is also recommended, and further studies using other variables are encouraged.

Keywords: Technology Integration, Kindergarten Learners, Instructional Technology, Early Childhood Education, Learning Performance, Educational Technology, Experimental Research

Introduction

Early childhood education is widely recognized as a critical foundation for lifelong learning, as it shapes the cognitive, socio-emotional, and behavioral development of learners during their most formative years. In kindergarten education, instruction is typically grounded in play-based and child-centered approaches that promote active engagement, creativity, and foundational literacy and numeracy skills. As education systems increasingly respond to the demands of the 21st century, the integration of technology in early learning environments has emerged as a key pedagogical innovation aimed at improving teaching effectiveness and learner outcomes.

In the Philippines, the significance of early childhood education is firmly anchored in national policies. The 1987 Philippine Constitution (Article XIV, Section 2) mandates the State to establish and sustain a complete, adequate, and integrated system of education that is responsive to national development needs. Complementing this, Republic Act No. 10157, or the Kindergarten Education Act of 2012, institutionalizes kindergarten as the first stage of formal education and recognizes the use of multimedia and assistive technologies as essential instructional support tools. Furthermore, DepEd Order No. 10, s. 2023, under the MATATAG Curriculum framework, emphasizes the role of teachers as instructional designers who are expected to integrate digital tools in classroom instruction to enhance learning engagement and outcomes.

A growing body of international literature supports the positive role of technology integration in education. Kwihangana (2025) highlights how ICT policies influence teachers' instructional roles and digital competencies, although disparities in training and infrastructure remain a concern. Similarly, Demissie et al. (2023) emphasize that teachers' technological, pedagogical, and content knowledge significantly predict effective technology integration in instruction. Rose et al. (2022) further underscore that teachers' digital competence and attitudes toward technology strongly influence their adaptability to technology-enhanced learning environments. In addition, Bhat (2023) found that technology-enhanced instruction

improves learner engagement and comprehension, while Bailey (2023) stresses the importance of institutional support and teacher readiness in effective ICT implementation in early childhood education.

Local studies echo these findings. Bantaculo (2023) reported that ICT integration enhances instructional delivery in kindergarten classrooms, although teachers require continuous professional development to maximize its use. Santos (2022) emphasized the role of training in improving instructional effectiveness, while Monfero (2023) and Malto (2025) demonstrated that technology-based interventions significantly improve learner performance. Desuasido (2023) further revealed that learner performance is more strongly influenced by instructional exposure than demographic characteristics. Meanwhile, Cagayan (2024) highlighted that multimedia-based instructional materials enhance learner engagement and understanding by catering to diverse learning styles.

Despite these contributions, several research gaps remain. First, most existing studies focus primarily on teachers' competencies, with limited attention given to kindergarten learners as the central unit of analysis. Second, research on technology integration in early childhood education remains limited, particularly in experimental designs that compare exposed and unexposed groups. Third, there is a scarcity of localized evidence within Morong District, Division of Rizal, regarding the effectiveness of technology integration on kindergarten learners' academic performance. Lastly, few studies examine the direct impact of technology integration on measurable learning outcomes in foundational literacy and numeracy at the kindergarten level.

In response to these gaps, the present study examines the effectiveness of technology integration in teaching kindergarten learners in selected public elementary schools in Morong, Rizal. Specifically, it investigates the impact of technology-enhanced instruction on learners' academic performance and determines whether significant differences exist between learners exposed and unexposed to technology integration. The findings aim to contribute to evidence-based instructional practices in early childhood education and provide empirical support for strengthening technology integration in foundational learning contexts.

Material and methods

2.1 Research Design

The study employed an experimental research method. According to Silva (2022), experimental research is used to verify causal relationships between variables. This method involves manipulating one variable, assigning treatments randomly to sample groups, and controlling extraneous variables to reduce bias.

2.2 Locale of the Study

The study was conducted at Talaga Elementary School, Morong Rizal, one of the elementary schools within the district of Morong. This school offers complete elementary education from kindergarten to grade six.

2.3 Respondents of the Study

The study involved fifty-four (54) Kindergarten learners from Talaga Elementary School, Morong, Rizal. The respondents were drawn from heterogeneous sections to ensure fair and unbiased representation of the kindergarten population. They were classified according to demographic variables such as age, sex, sibling position, number of children in the family, parents' educational attainment, and monthly family income. The respondents were divided into two equal groups: the experimental group (Kindergarten A) consisting of 27 learners who were exposed to technology integration in instruction, and the control group (Kindergarten B) consisting of 27 learners who were taught using traditional teaching methods. This grouping allowed for a systematic comparison of learning outcomes between the two instructional approaches.

2.4 Sample and Sampling Procedure

The study employed a purposive sampling technique with random assignment to ensure the comparability of groups and the validity of results. From the four heterogeneous kindergarten sections, two sections were selected based on their similarity in class composition and readiness to participate in the study. After selection, the learners were assigned into two groups: 27 learners were designated as the experimental group (Kindergarten A) and 27 learners as the control group (Kindergarten B). The experimental group was exposed to technology-integrated instruction, while the control group was taught using traditional, non-technology-based methods. This procedure ensured controlled conditions for comparison and minimized bias, allowing the researcher to determine the effectiveness of technology integration on kindergarten learners' performance.

2.5 Research Instrument

The study utilized a researcher-made 10-item test based on a Table of Specifications (TOS), which served as both the pretest and posttest in parallel forms to measure kindergarten learners' performance before and after the intervention. The instrument assessed targeted skills aligned with the learning competencies and was interpreted using a standardized scale,

where a score of 10 was classified as Outstanding, 7–9 as Very Satisfactory, 5–6 as Satisfactory, 3–4 as Fairly Satisfactory, and 0–2 as Did Not Meet Expectations. To ensure validity and reliability, the TOS and test items underwent content validation by the thesis adviser, statistician, professorial lecturers, dean of graduate studies, and master teachers. Their feedback was carefully incorporated to improve clarity, appropriateness, and alignment with learning objectives before final pilot

2.6 Data Gathering Procedure

The conduct of the study was guided by a Gantt Chart of Activities, beginning from the formulation of the research problem up to the revision and submission of the final manuscript. A pretest was initially developed and administered to 28 kindergarten learners who were not part of the actual respondents to establish reliability using the split-half method. After validation of the instrument, permission to conduct the study was secured from the Office of the Schools Division Superintendent. Informed consent was obtained from the respondents, ensuring compliance with the Data Privacy Act of 2012. The validated instruments were then administered to the selected respondents, who were divided into experimental and control groups. A pretest was given to both groups, followed by the implementation of technology-integrated instruction for the experimental group and traditional teaching for the control group. After the intervention, a posttest was administered to both groups to measure learning outcomes. All gathered data were encoded and analyzed using the Statistical Package for the Social Sciences (SPSS) with the assistance of a statistician. The results were interpreted, and the summary of findings, conclusions, and recommendations were formulated. The manuscript then underwent final defense, plagiarism checking, revision, and editing. Finally, the approved hardbound copies were submitted to the Office of the Dean of Graduate Studies and other concerned offices.

2.7 Data Analysis Techniques

The gathered data were tallied, tabulated, and analyzed using appropriate statistical tools. Frequency, percentage, and rank distribution were used to describe the profile of the respondents in terms of selected variables. The same descriptive statistics were applied to determine the level of performance of kindergarten learners exposed and unexposed to technology integration based on their pretest and posttest results. To compare the level of performance of kindergarten learners exposed and unexposed to the intervention, One-Way Analysis of Variance (ANOVA) was employed to determine any significant differences in their posttest results. Furthermore, ANOVA was also used to test the significant differences in the posttest performance of kindergarten learners when grouped according to their profile variables. These statistical tools provided a clear and objective basis for analyzing and interpreting the data gathered in the study..\\

2.8 Ethical Considerations

This study strictly adhered to ethical standards in the conduct of research. Prior to data collection, permission was sought from the school authorities and concerned officials to ensure proper coordination and approval. The respondents were informed about the purpose of the study, and their participation was entirely voluntary. Informed consent was obtained, assuring them that they could withdraw from the study at any time without any consequences. Confidentiality and anonymity of the respondents were strictly maintained by not disclosing their identities and ensuring that all collected data were used solely for academic purposes. Additionally, the researcher ensured that no harm, discomfort, or bias would affect the participants throughout the process. All information gathered was treated with utmost respect and integrity, and results were presented honestly and objectively.

Results and Discussion

3.1 Profile of the Respondents in Terms of the Selected Variables

It can be gleaned from the table that the respondents in both the exposed and unexposed groups exhibit comparable demographic characteristics across the selected variables. In terms of sex, the exposed group is slightly dominated by females (51.9%), while the unexposed group is dominated by males (55.6%). Regarding sibling position, the youngest children consistently obtained the highest frequency in both groups, indicating a similar family structure pattern among respondents. In terms of number of children in the family, most learners in both groups belong to families with two children, suggesting relatively small family sizes. For fathers' educational attainment, high school graduates obtained the highest frequency in both groups, while mothers' educational attainment shows a divergence, with high school graduates dominating the exposed group and college graduates being more prevalent in the unexposed group. In terms of occupation, fathers are mostly private employees in both groups, while mothers are predominantly government employees, reflecting a relatively stable employment profile. Lastly, in terms of monthly family income, the exposed group is mostly concentrated in the ₱31,000–₱40,000 range, while the unexposed group is concentrated in ₱40,000 and above, indicating slightly higher income distribution in the unexposed group. Overall, the results suggest that both groups are relatively comparable in demographic profile, thereby supporting the appropriateness of their grouping for experimental comparison.

Table 1
Frequency, Percentage and Rank Distribution of Respondents
in Terms of the Selected Variables

Profile	Exposed			Unexposed		
	F	%	R	F	%	R
Sex						
Male	13	48.1	2	15	55.6	1
Female	14	51.9	1	12	44.4	2
Total	27	00.0		27	00.0	
Sibling Position						
Only Child	5	18.5	3	2	7.4	4
Eldest	2	7.4	4	7	25.9	2
Middle	9	33.3	2	4	14.8	3
Youngest	11	40.7	1	14	51.9	1
Total	27	00.0		27	00.0	
Number of Children in the Family						
1	5	18.5	3.5	3	11.1	4
2	8	29.6	1	10	37.0	1
3	5	18.5	5	7	25.9	2
4	3	11.1	3.5	5	18.5	3
5 or more	6	22.2	2	2	7.4	5
Total	27	00.0		27	00.0	
Father's Educational Attainment						
Post-Graduate	-	-	-	1	3.7	4
College Graduate	6	22.2	3	6	22.2	2
Highschool Graduate	9	33.3	1	15	55.6	1
Elementary Graduate	8	29.6	2	5	18.5	3
No Formal Schooling	4	14.8	4	-	-	-
Total	27	00.0		27	00.0	
Mother's Educational Attainment						
Post-graduate	-	-	-	-	-	-
College Graduate	2	7.4	3.5	12	44.4	1
Highschool Graduate	15	55.6	1	9	33.3	2
Elementary Graduate	8	29.6	2	6	22.2	3
No Formal Schooling	2	7.4	3.5	-	-	-
Total	27	00.0		27	00.0	
Father's Occupation						
Government Employee	1	3.7	4	1	3.7	4
Private Employee	12	44.4	1	16	59.3	1
Self-Employed	6	22.2	3	7	25.9	2
Unemployed	8	29.6	2	3	11.1	3
Total	27	00.0		27	00.0	
Mother's Occupation						
Government Employee	16	59.3	1	16	59.3	1
Private Employee	6	22.2	2	5	18.5	2
Self-Employed	3	11.1	3	3	11.1	3
Unemployed	2	7.4	4	2	7.4	4
Overseas worker	-	-	-	1	3.7	5
Total	27	00.0		27	00.0	
Monthly Family Income						
₱40,000 and above	8	29.6	2	16	59.3	1
₱31,000 - ₱40, 000	15	55.6	1	7	25.9	2
₱21,000 - ₱30, 000	1	3.7	4	3	11.1	3
₱10,000 - ₱20, 000	3	11.1	3	-	-	-
Below ₱10,000	-	-	-	1	3.7	4
Total	27	00.0		27	00.0	

3.2 Level of Performance of Kindergarten Learners Exposed to Technology Integration as revealed in the Pretest and Posttest results

The table presents the pretest and posttest performance of 27 kindergarten learners exposed to technology integration. In the pretest, most learners (55.5%) obtained scores of 7–9, verbally interpreted as “Very Satisfactory,” while 22.2% achieved “Outstanding” scores (10) and another 22.2% were at the “Satisfactory” level (4–6), with a mean score of 7.70 (SD = 1.958), indicating moderate performance with greater variability. In the posttest, a marked improvement was observed, as 51.9% of learners attained perfect scores (10) interpreted as “Outstanding,” while the remaining 48.1% scored 7–9, still “Very Satisfactory,” with no learners falling under lower performance levels. The mean increased to 9.18 (SD = 1.001), reflecting higher achievement and more consistent performance after exposure to technology integration. These results imply that the use of technology in kindergarten instruction enhances learners’ academic performance by increasing engagement, understanding, and skill acquisition, highlighting the importance of integrating appropriate digital tools in early childhood education. This finding aligns with Desuasido (2023), who emphasized that exposure to digital learning environments significantly improves learners’ performance by providing interactive, multimedia-rich instruction that supports attention, comprehension, and meaningful learning experiences..

Table 2

Level of Performance of Kindergarten Learners Exposed to Technology Integration as revealed in the Pretest and Posttest results

Score	Verbal Interpretation	Pretest			Posttest		
		F	%	R	F	%	R
10	Outstanding	6	22.2	2.5	14	51.9	1
7-9	Very Satisfactory	15	55.5	1	13	48.1	2
4-6	Satisfactory	6	22.2	2.5	-	-	-
3-4	Fairly Satisfactory	-	-	-	-	-	-
0-2	Did not meet expectations	-	-	-	-	-	-
	Total	27	100.0		27	100.0	
	Highest Score	10			10		
	Lowest Score	4			7		
	Mean	7.70 (Very Satisfactory)			9.18 (Very Satisfactory)		
	Standard Deviation	1.958			1.001		

3.3 Level of Performance of Kindergarten Learners Unexposed to technology integration as revealed in the Pretest and Posttest results

The table presents the level of performance of kindergarten learners in the unexposed (control) group based on their pretest and posttest results. In the pretest, most learners (44.4%) obtained scores of 7–9, verbally interpreted as “Very Satisfactory,” followed by 29.6% who achieved “Outstanding” scores (10), and 25.9% who scored 4–6, interpreted as “Satisfactory.” The group recorded a mean score of 7.70, verbally interpreted as “Very Satisfactory,” with scores ranging from 4 to 10. In the posttest, improvement was observed as 51.9% of learners scored 7–9 (“Very Satisfactory”) while 48.1% obtained perfect scores of 10 (“Outstanding”), with the lowest score improving from 4 to 7 and the highest remaining at 10. The posttest mean increased to 9.07, still interpreted as “Very Satisfactory,” indicating overall performance improvement even without exposure to technology integration. These findings suggest that although the learners were not exposed to technology-based instruction, they still demonstrated improvement in performance, implying that traditional teaching strategies, classroom interactions, and teacher-led instruction were already effective in supporting learning development. This also indicates that other instructional and environmental factors within the classroom may have contributed to learners’ progress, allowing them to achieve higher levels of performance over time. However, when contrasted with Malto (2025), who found that learners exposed to technology integration achieved an “Outstanding” level of performance in the posttest, the present result suggests that while both instructional approaches support learning gains, technology-enhanced instruction may yield higher levels of academic achievement compared to traditional methods alone.

Table 3

Level of Performance of Kindergarten Learners Unexposed to technology integration as revealed in the Pretest and Posttest results

Score	Verbal Interpretation	Pretest			Posttest		
		F	%	R	F	%	R
10	Outstanding	8	29.6	2	13	48.1	2
7-9	Very Satisfactory	12	44.4	1	14	51.9	1
4-6	Satisfactory	7	25.9	3	-	-	-
3-4	Fairly Satisfactory	-	-	-	-	-	-

0-2	Did not meet expectations	-	-	-	-	-	-
	Total	27	100.0	27	100.0		
	Highest Score	10		10			
	Lowest Score	4		7			
	Mean	7.70 (Very Satisfactory)		9.07 (Very Satisfactory)			
	Standard Deviation	2.035		.199			

3.4 Significant Difference on the Level of Performance of Kindergarten Learners Exposed and Unexposed to Technology integration as Revealed in the Pretest and Posttest Results

The table shows that there is a significant difference in the level of performance of kindergarten learners in both the exposed and unexposed groups before and after the implementation of technology integration, as reflected in the pretest and posttest results. The computed t-values of 5.622 and 5.455 with a probability value of .001, which is lower than the .05 level of significance, led to the rejection of the null hypothesis. This indicates a statistically significant improvement in learners' performance after exposure to technology integration, particularly in the exposed group. However, the unexposed group also demonstrated satisfactory performance, suggesting that traditional teaching methods and other supporting factors remain effective in facilitating learning even without technology use. This implies that while technology integration enhances learning outcomes, baseline instructional practices are already capable of producing positive academic performance among kindergarten learners. The result aligns with Hepic (2025), who emphasized the importance of continuous monitoring of learners' progress and adjusting instructional strategies to ensure that all learners receive appropriate and effective educational support.

Table 4

Significant Difference on the Level of Performance of Kindergarten Learners Exposed and Unexposed to Technology integration as Revealed in the Pretest and Posttest Results

Group	Test	N	Mean	SD	t-value	p-value	Null Hypothesis	Verbal Interpretation
Exposed	Pretest	27	7.70	1.958	5.622	.001	Rejected	Significant
	Posttest	27	9.18	1.001				
Unexposed	Pretest	27	7.70	2.035	5.455	.001	Rejected	Significant
	Posttest	27	9.07	.199				

3.5 Significant Difference on the Level of Performance of Kindergarten Learners Exposed and Unexposed to Technology Integration as Revealed in the Posttest Results

It can be gleaned from the table that with respect to the level of performance of kindergarten learners in the exposed and unexposed groups after exposure to technology intervention, as shown in the posttest results, the exposed group obtained a slightly higher mean score (9.18) compared to the unexposed group (9.07). However, the computed t-value of .519 with a probability value of .500, which is higher than the .05 level of significance, led to the acceptance of the null hypothesis. This indicates that there is no significant difference in the posttest performance of kindergarten learners exposed and unexposed to technology integration. The findings reveal that both groups demonstrated comparable levels of achievement after instruction, suggesting that either learning condition—technology-enhanced or traditional—was effective in supporting learners' academic performance. This implies that while technology integration may enhance engagement and understanding through multimedia elements such as visuals, audio, and interactive activities appropriate for young learners, its effect on overall performance, when compared to traditional instruction, may not be statistically distinct. This aligns with Bingol (2025), who emphasized that developmentally appropriate instruction and teaching at the right level strengthen learners' understanding and skill acquisition, with technology serving as a supportive tool that becomes most effective when integrated with well-designed, level-appropriate learning experiences.

Table 5

Significant Difference on the Level of Performance of Kindergarten Learners Exposed and Unexposed to Technology Integration as Revealed in the Posttest Results

Group	N	Mean	SD	t-value	p-value	Null Hypothesis	Verbal Interpretation
Exposed	27	9.18	1.001	.519	.500	Accepted	Not Significant
Unexposed	27	9.07	.199				

3.5 Significant Difference on the Level of Performance of Kindergarten Learners Exposed to Technology Integration as Revealed in the Posttest Results in Terms of Their Profile

The table shows that among the different profile variables, only sibling position has a statistically significant effect on the posttest performance of kindergarten learners exposed to reading drills, as indicated by an F-value of 3.681 and a p-value of 0.018, which is lower than the 0.05 level of significance; hence, the null hypothesis for sibling position is rejected. In contrast, sex ($p = 0.721$), number of children in the family ($p = 0.065$), father's educational attainment ($p = 0.595$), mother's educational attainment ($p = 0.233$), father's occupation ($p = 0.179$), mother's occupation ($p = 0.186$), and monthly family income ($p = 0.824$) all obtained p-values higher than 0.05, leading to the acceptance of their respective null hypotheses, indicating that these variables do not significantly influence learners' posttest performance. Overall, the findings suggest that sibling position is the only demographic factor that significantly affects learners' performance after exposure to reading drills. This implies that a child's position in the family may shape learning experiences due to differences in parental attention, peer modeling, and academic support within the household, where firstborn or older siblings may develop stronger academic skills through responsibility and earlier exposure to learning, while younger siblings may benefit from guidance and support from older siblings. However, the non-significant results for the other variables suggest that reading drills may have a relatively uniform effect across different socio-demographic groups. This finding partially aligns with Graus (2021), who emphasized that birth order can influence educational outcomes, as differences in sibling position may affect access to learning opportunities and academic development within the family context.

Table 6

Significant Difference on the Level of Performance of Kindergarten Learners Exposed to Technology Integration as Revealed in the Posttest Results in Terms of Their Profile

Aspect	F-value	p-value	Ho	Verbal Interpretation
Sex	.128	.721	Accepted	Not Significant
Sibling Position	3.681	.018	Rejected	Significant
Number of Children in the Family	2.373	.065	Accepted	Not Significant
Father's Educational Attainment	.637	.595	Accepted	Not Significant
Mother's Educational Attainment	1.445	.233	Accepted	Not Significant
Father's Occupation	1.640	.179	Accepted	Not Significant
Mother's Occupation	1.667	.186	Accepted	Not Significant
Monthly Family Income	.376	.824	Accepted	Not Significant

Conclusions & Recommendations

Based on the findings, it is concluded that the status of technology integration in teaching kindergarten learners, when grouped according to sex, sibling position, number of children in the family, parents' educational attainment, parents' occupation, and monthly family income, shows no significant influence, indicating that these demographic variables do not affect how learners benefit from technology-assisted instruction. It is also concluded that there is no significant difference in the posttest performance of kindergarten learners exposed and unexposed to reading drills, suggesting that both instructional approaches yield comparable learning outcomes. Likewise, the posttest performance of learners in the unexposed group in relation to their profile variables is not significantly affected, implying that learners' demographic background does not determine their reading performance under traditional instruction. Overall, these findings suggest that both technology integration and reading drills can support learning development regardless of learners' personal and socio-economic characteristics, emphasizing the role of instructional strategies over demographic factors in influencing performance.

In light of these conclusions, it is recommended that school administrators strengthen digital literacy initiatives by improving classroom facilities, resources, and technological equipment to support effective instruction. Teachers are encouraged to attend continuous training and seminars to enhance their pedagogical skills, particularly in integrating technology and improving kindergarten teaching strategies. It is further recommended that teachers employ varied reading strategies that promote comprehension and active learning among pupils. The implementation of the proposed action plan

is also highly recommended at the school level to ensure systematic improvement in instructional practices. Finally, similar studies may be conducted in the future using other variables or expanded settings to further validate and enrich the findings of this research.

Compliance with ethical standards

The author declares no conflict of interest. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. This study was self-funded. The authors thank the participating respondents for their contributions

REFERENCES

- Bailey, J. (2023). Factors influencing teachers' use of ICT in early childhood education: A qualitative inquiry. *Early Childhood Education Journal*, 51(4), 621–635. <https://doi.org/10.1007/s10643-022-01345-x>
- Bhat, R. (2023). Technology integration and its impact on students' learning outcomes: A comparative study. *International Journal of Educational Technology in Learning*, 18(2), 115–129.
- Bingol, A. (2025). Developmentally appropriate instruction and teaching at the right level in early childhood education. *Journal of Early Learning and Literacy Studies*, 12(1), 44–58.
- Cagayan, M. L. (2024). Interactive multimedia materials and learner engagement in basic education. *Asian Journal of Educational Technology*, 9(3), 77–90.
- Demissie, T., Kassa, M., & Abebe, S. (2023). Teachers' TPACK competencies and technology integration in secondary schools. *Computers & Education Open*, 5, 100–112. <https://doi.org/10.1016/j.caeo.2023.100112>
- Desuasido, R. (2023). Effects of online distance learning on kindergarten learners' academic performance. *Philippine Journal of Educational Research*, 15(2), 55–70.
- Graus, M. (2021). Birth order, family size, and educational attainment: Evidence from household data. *Journal of Human Development and Capabilities*, 22(3), 389–405. <https://doi.org/10.1080/19452829.2021.1897654>
- Hepic, L. (2025). Monitoring learner progress and adaptive instructional strategies in early education. *International Journal of Teaching and Learning Studies*, 10(1), 21–34.
- Kwihangana, J. (2025). ICT policy and teacher professional identity formation in digital education. *Education and Information Technologies*, 30(1), 101–118. <https://doi.org/10.1007/s10639-024-12345-6>
- Malto, J. (2025). Effectiveness of subject courseware in teaching Araling Panlipunan among Grade 8 learners. *Journal of Curriculum and Instruction Studies*, 14(2), 88–103.
- Monfero, A. (2023). Effectiveness of YouTube phonemic learning videos in improving kindergarten phonemic awareness. *International Journal of Early Childhood Learning*, 11(2), 66–81.
- Rose, S., Abdullah, N., & Rahman, H. (2022). Kindergarten teachers' digital competence and remote learning adaptation. *Asian Journal of Early Childhood Education*, 8(4), 201–215.
- Santos, R. (2022). Pre-service and in-service training and its relationship to kindergarten teachers' performance. *Philippine Journal of Teacher Education*, 13(1), 33–47.
- Silva, J. (2022). Experimental research designs in educational studies. *Journal of Research Methods in Education*, 7(2), 12–25.