

Effects of Technologies on the Behavior and Academic Performance of Grade Four Pupils

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Abstract

This study determined the effects of technologies on the behavior and academic performance of Grade Four pupils in public elementary schools in District I-A, City Schools Division of Antipolo during the School Year 2025–2026. Specifically, it examined the perceived effects of technology on pupils' behavior in terms of digital addiction, social and emotional changes, and enhanced connectivity; identified differences in these effects according to selected demographic variables; assessed the pupils' academic performance; and determined the relationship between the perceived effects of technology and academic performance. The study employed a descriptive survey research design complemented by documentary analysis. The respondents consisted of 390 randomly selected Grade Four pupils from Bagong Nayon I Elementary School, Dela Paz Elementary School, and Santa Cruz Elementary School, with the sample size determined using Slovin's formula. Data were gathered through a validated researcher-made questionnaire, while pupils' average grades served as the basis for measuring academic performance. Descriptive and inferential statistical tools were used to analyze the data. Findings revealed that the respondents were predominantly male, mostly first- and second-born children from families with more than two children, with monthly family incomes of ₱20,000 and above. Most parents were college undergraduates or graduates and were employed or self-employed. Technologies had a very high effect on enhanced connectivity, a high effect on social and emotional changes, and a moderate effect on digital addiction. No significant differences were found in the perceived effects of technology when grouped according to sex, sibling position, and number of children in the family, while significant differences existed based on monthly family income, parents' educational attainment, and parents' occupation. The pupils' academic performance was generally satisfactory, and a significant relationship was established between the perceived effects of technology on behavior and academic performance. The study concluded that family socioeconomic and educational factors significantly influence pupils' technology-related behavior, which, in turn, affects academic performance. It recommended implementing school-based intervention programs, strengthening parent-teacher collaboration to promote responsible technology use, adopting the proposed action plan, and conducting further studies incorporating additional variables.

Keywords: Technology Use, Behavior, Academic Performance, Digital Addiction, Enhanced Connectivity, Social And Emotional Changes, Grade Four Pupils, Descriptive Survey Research.

Introduction

Technology has become an indispensable component of modern education, transforming how learners acquire knowledge, communicate, and accomplish academic tasks. The widespread availability of smartphones, tablets, computers, and internet connectivity has enabled elementary pupils to access educational resources beyond the classroom, promoting flexible and interactive learning experiences. However, the increasing use of digital devices has also raised concerns regarding excessive screen time, digital addiction, behavioral changes, and their influence on learners' academic achievement. As children in the elementary level are in a critical stage of cognitive, emotional, and social development, understanding the effects of technology on their behavior and academic performance has become increasingly relevant in educational research (Kuş, 2025).

Recent studies have highlighted the educational benefits of technology when appropriately integrated into instruction. A meta-analysis by Li et al. (2025) concluded that Information and Communication Technology (ICT) significantly improves learning outcomes among early childhood and primary school learners, particularly in language development and subject knowledge acquisition. The study further emphasized that the effectiveness of technology depends on instructional design, duration of intervention, and appropriate classroom implementation rather than technology itself.

Similarly, Kuş (2025) synthesized findings from 63 studies involving more than 124,000 students and reported that technology-related factors, including smartphone use, social media engagement, and digital learning, significantly influence academic performance. While educational technology can facilitate learning, excessive recreational use and smartphone addiction negatively affect students' academic achievement, highlighting the importance of balanced technology utilization.

Within the Philippine setting, Venus (2025) found that digital technology positively influences learners' motivation, cognitive development, and task accomplishment among Grade 7 students in Rizal. The study demonstrated that appropriate technology integration significantly enhances learning interest and academic performance, reinforcing the value of technology as an educational tool when properly managed.

Likewise, Peradillo and Martin (2025) examined ICT screen time among primary learners and reported that pupils spent an average of approximately 2.5 hours daily using digital devices while maintaining satisfactory academic performance. Their findings suggest that moderate technology exposure does not necessarily hinder academic achievement; rather, responsible and supervised technology use contributes to productive learning experiences.

On the other hand, emerging evidence also points to the behavioral risks associated with excessive technology use. A recent systematic review and meta-analysis published in *JAMA Pediatrics* found that greater parental technology use in children's presence was associated with poorer cognitive development, weaker prosocial behavior, increased emotional and behavioral problems, and higher screen time among young children. The study emphasized that family technology practices significantly shape children's behavioral development.

Recent educational literature also recognizes that technology may become a source of distraction when not properly regulated. Students who excessively engage with digital devices often experience reduced concentration, diminished classroom participation, and lower academic productivity. These findings underscore the need for schools and parents to establish balanced technology practices that maximize educational benefits while minimizing distractions.

In the Philippines, technology integration has rapidly expanded following the implementation of flexible and blended learning modalities. While existing local studies have investigated technology's influence on learning interest, ICT access, and academic performance, limited evidence simultaneously examines behavioral dimensions such as digital addiction, social and emotional changes, and enhanced connectivity among elementary pupils. Moreover, few studies have explored how demographic characteristics—including parents' educational attainment, occupation, family income, sibling position, and family size—shape pupils' perceptions of technology's effects.

Despite the growing body of literature, several research gaps remain. First, most recent studies have focused on secondary or higher education learners, with limited investigations involving Grade Four pupils in Philippine public elementary schools. Second, contemporary studies generally examine either academic performance or technology use independently, with fewer studies integrating behavioral dimensions such as digital addiction, social and emotional changes, and enhanced connectivity. Third, existing Philippine studies have concentrated on learning interest and ICT access but have not comprehensively examined how technology-related behavioral changes are associated with pupils' academic performance. Finally, the influence of socioeconomic variables—including parents' educational attainment, occupation, and monthly family income—remains underexplored among elementary learners. Hence, this study seeks to address these gaps by determining the effects of technologies on the behavior and academic performance of Grade Four pupils in selected public elementary schools in District I-A, City Schools Division of Antipolo, providing evidence that may guide educators, parents, and school administrators in promoting responsible technology use and improving learners' educational outcomes.

Material and methods

2.1 Research Design

This study employed a descriptive survey research design complemented by documentary analysis to determine the effects of technologies on the behavior and academic performance of Grade Four pupils. The descriptive survey gathered pupils' perceptions regarding the effects of technology on their behavior, while documentary analysis utilized the pupils' average grades to assess their academic performance.

2.2 Locale of the Study

The study was conducted in Bagong Nayan I Elementary School, Dela Paz Elementary School, and Santa Cruz Elementary School, all located in District I-A, City Schools Division of Antipolo, during the School Year 2025–2026. These schools were selected because they represent public elementary schools where technology use among Grade Four pupils is prevalent.

2.3 Respondents of the Study

The respondents of the study were 390 Grade Four pupils enrolled in the selected public elementary schools in District I-A, City Schools Division of Antipolo during the School Year 2025–2026. They served as the primary sources of information regarding the perceived effects of technologies on their behavior.

2.4 Sample and Sampling Procedure

The sample size of 390 respondents was determined using Slovin's Formula, while the respondents were selected through the simple random sampling technique to ensure that every Grade Four pupil had an equal opportunity to participate in the study.

2.5 Research Instrument

Data were collected using a researcher-made questionnaire consisting of two parts: the first part gathered the demographic profile of the respondents, while the second part measured the extent of the effects of technologies on pupils' behavior in terms of digital addiction, social and emotional changes, and enhanced connectivity using a five-point Likert scale. The instrument underwent validation by experts and reliability testing prior to its administration.

2.6 Data Gathering Procedure

After securing the necessary approvals from the concerned school authorities, the researcher administered the validated questionnaire to the selected respondents. Upon retrieval of the accomplished questionnaires, the pupils' average grades were obtained from school records with proper authorization to serve as the basis for determining their academic performance, after which all collected data were organized for statistical analysis.

2.7 Data Analysis Techniques

The collected data were analyzed using appropriate descriptive and inferential statistical tools. Frequency, percentage, weighted mean, and standard deviation were used to describe the respondents' profile and the extent of the effects of technologies on behavior, while t-test, Analysis of Variance (ANOVA), and Pearson Product-Moment Correlation Coefficient (Pearson r) were employed to determine significant differences and relationships among the variables at the 0.05 level of significance.

2.8 Ethical Considerations

The study adhered to established ethical principles throughout the research process. Prior to data collection, permission was obtained from the concerned authorities and participating manufacturing companies. All respondents were informed of the purpose, procedures, and voluntary nature of the study, and their informed consent was secured before participation. Confidentiality and anonymity of the respondents were strictly maintained by ensuring that no personal or company-identifiable information was disclosed in the presentation of the results. Participants were assured that they could withdraw from the study at any time without any consequences. The data gathered were used solely for academic and research purposes, stored securely, and handled in accordance with the agreed confidentiality and non-disclosure provisions to protect the privacy and integrity of both the respondents and the participating organizations.

Results and Discussion

3.1 Profile of the Respondents in terms of the Selected Variables

As shown in the table, out of 390 respondents, 51 % are males and 49% are females. In terms of sibling position, 24.1 % are first born, 23.1 % are second born and 19% are third born child. As to the number of children in the family, 35.1% belong to families with 2-3 number of children while 32.1 % belong to families with 4-5 children. In terms of monthly family income, 31.8 % have monthly family income of ₱ 20,000-₱ 24,999 while 25.4% have monthly family income of ₱ 30,000 and above. As to their parents' educational attainment, most of the parents are college undergraduates and college graduates. In terms of parents' occupation, most of the parents are employed and self-employed. In terms of frequency of technology use, 50.8% Always use technology and 34.3% Often use technology. Meanwhile, 12.3% Sometimes used and only 2.6% rarely used technology.

Table 1
Profile of the Respondents

Sex	F	%	R			
Male	199	51.0	1			
Female	191	49.0	2			
Total	390	100.0				
Sibling Position						
1 st	94	24.1	1			
2 nd	90	23.1	2			
3 rd	74	19.0	3			
4 th	68	17.4	4			
5 th & above	64	16.4	5			
Total	390	100.0				
Number of Children in the Family						
1	111	28.4	3			
2-3	137	35.1	1			
4-5	125	32.1	2			
6 & above	17	4.4	4			
Total	390	100.0				
Monthly Family Income						
₱ 30,000 and above	99	25.4	2			
₱ 25,000-₱ 29,999	95	24.3	3			
₱ 20,000-₱ 24,999	124	31.8	1			
below ₱ 20,000	72	18.5	4			
Total	390	100.0				
Educational Attainment	Father			Mother		
	F	%	R	f	%	R
College Graduate	96	24.6	2	99	25.4	2
College Undergraduate	100	25.6	1	146	37.4	1
High School Graduate	90	23.1	3	69	17.7	3
High School Undergraduate	85	21.8	4	64	16.4	4
Elementary Graduate	19	4.9	5	12	3.1	5
Total	390	100.0		390	100.0	
Parents' Occupation	Father			Mother		
	F	%	R	f	%	R
Employed (Local)	138	35.3	1	125	32.0	1
OFW	12	3.1	6	14	3.6	6
Self Employed	93	23.9	2	98	25.1	2
Entrepreneur	74	19.0	3	72	18.5	3
Housewife/ Househusband	45	11.5	4	55	14.1	4
Others	28	7.2	5	26	6.7	5
Total	390	100.0		390	100.0	
Frequency of Technology Use						
Always	195		50.0		1	
Often	137		35.1		2	
Sometimes	48		12.3		3	
Rarely	10		2.6		4	
Total	390		100.0			

3.2 Extent of Effects of Technologies on the Behavior of Grade Four Pupils as Perceived by Themselves with Respect to the Different Aspects

Table 2 presents the summary of the extent of the effects of technologies on the behavior of Grade Four pupils as perceived by themselves. The overall composite weighted mean of 3.83, interpreted as High Effect, indicates that technology substantially influences pupils' behavior. Among the three aspects, Enhanced Connectivity ranked first with a weighted mean of 4.60 (Very High Effect), demonstrating that technology greatly facilitates communication, information sharing, and social interaction. This was followed by Social and Emotional Changes with a weighted mean of 3.81 (High Effect), suggesting that technology significantly influences pupils' emotions and interpersonal relationships. Digital Addiction ranked last with a weighted mean of 3.08 (Moderate Effect), indicating that although pupils exhibit some dependence on

digital devices, it has not yet become pervasive enough to severely interfere with their daily responsibilities. These findings suggest that while technology serves as a valuable tool for enhancing connectivity and learning opportunities, it also influences pupils' social and emotional development and presents a moderate risk of addictive behavior. Hence, schools and parents should maximize the educational benefits of technology while promoting responsible digital habits, balanced screen time, and emotional well-being among learners. The findings support the assertion of Kishore (2023) that technology enhances learning by making instruction more engaging, collaborative, and accessible, thereby improving how learners acquire, process, and share information.

Table 2

Extent of Effects of Technologies on the Behavior of Grade Four Pupils as Perceived by Themselves with Respect to the Different Aspects

Aspects	Overall W $\bar{X}$	Verbal Interpretation	Rank
Digital Addiction	3.08	Moderate Effect	3
Social and Emotional Changes	3.81	High Effect	2
Enhanced Connectivity	4.60	Very High Effect	1
Composite W$\bar{X}$	3.83	High Effect	

3.3 Significant Difference on the Extent of Effects of Technologies on the Behavior of Grade Four Pupils as Perceived by Themselves With Respect to the Different Aspects Terms of Their Profile

Table 3 presents the results of the F-test on the significant difference in the extent of the effects of technologies on the behavior of Grade Four pupils as perceived by themselves when grouped according to their profile. The findings revealed no significant differences in the perceived effects of technology on digital addiction, social and emotional changes, and enhanced connectivity when respondents were classified according to sex, sibling position, and number of children in the family, as all computed p-values were greater than the 0.05 level of significance. Conversely, monthly family income, fathers' and mothers' educational attainment, and fathers' and mothers' occupation yielded p-values less than 0.05 across all behavioral aspects, indicating significant differences in pupils' perceptions of technology's effects. These findings suggest that pupils' experiences with technology are influenced more by their family's socioeconomic and educational background than by their personal characteristics or family size. Pupils from families with greater economic resources and higher parental educational attainment may have broader access to digital devices, stronger parental guidance, and more opportunities for productive technology use, resulting in varying behavioral outcomes. The results imply the need for schools to strengthen digital equity initiatives, provide technology access and digital citizenship programs, and foster stronger parent-school collaboration to ensure that all pupils develop responsible technology use regardless of socioeconomic status. These findings are consistent with Gamez (2023), who reported that students' digital competence and technology-related behaviors significantly vary according to their socioeconomic status and parents' educational attainment and occupation.

Table 3

Significant Difference on the Extent of Effects of Technologies on the Behavior of Grade Four Pupils as Perceived by Themselves With Respect to the Different Aspects Terms of Their Profile

Aspects/Variables	F-value	p-value	Ho	Verbal Interpretation
Sex				
Digital Addiction	0.621	0.411	Accepted	Not Significant
Social and Emotional Changes	1.732	0.124	Accepted	Not Significant
Enhanced Connectivity	0.743	0.545	Accepted	Not Significant
Sibling Position				
Digital Addiction	1.033	0.354	Accepted	Not Significant
Social and Emotional Changes	0.493	0.712	Accepted	Not Significant
Enhanced Connectivity	0.722	0.521	Accepted	Not Significant
Number of Children in the Family				
Digital Addiction	0.822	0.432	Accepted	Not Significant
Social and Emotional Changes	0.119	0.984	Accepted	Not Significant
Enhanced Connectivity	0.421	0.762	Accepted	Not Significant
Monthly Family Income				
Digital Addiction	4.813	0.012	Rejected	Significant
Social and Emotional Changes	6.243	0.008	Rejected	Significant
Enhanced Connectivity	5.533	0.012	Rejected	Significant
Fathers' Educational Attainment				
Digital Addiction	6.332	0.021	Rejected	Significant

Social and Emotional Changes	7.143	0.009	Rejected	Significant
Enhanced Connectivity	4.821	0.003	Rejected	Significant
Mothers' Educational Attainment				
Digital Addiction	6.056	0.032	Rejected	Significant
Social and Emotional Changes	9.321	0.009	Rejected	Significant
Enhanced Connectivity	7.443	0.041	Rejected	Significant
Fathers' Occupation				
Digital Addiction	12.032	0.005	Rejected	Significant
Social and Emotional Changes	8.481	0.011	Rejected	Significant
Enhanced Connectivity	6.942	0.021	Rejected	Significant
Mothers' Occupation				
Digital Addiction	10.909	0.004	Rejected	Significant
Social and Emotional Changes	8.621	0.038	Rejected	Significant
Enhanced Connectivity	11.722	0.012	Rejected	Significant

3.4 Level of Academic Performance of Grade Four Pupils as Revealed by Their Average Grades

Table 4 presents the level of academic performance of the Grade Four pupils based on their average grades. The results revealed that the largest proportion of respondents (31.6%) attained a Satisfactory rating (80–84), followed by 28.2% with a Very Satisfactory rating (85–89), 21.5% with an Outstanding rating (90 and above), and 18.7% with a Fairly Satisfactory rating (75–79). None of the respondents fell under the Did Not Meet Expectations category. The pupils obtained a mean grade of 84.06, interpreted as Satisfactory, with a standard deviation of 7.310, indicating moderate variation in academic performance. These findings suggest that the Grade Four pupils generally achieved satisfactory academic outcomes and were able to meet the expected learning competencies. The absence of failing grades reflects the effectiveness of classroom instruction, learners' study habits, and the support provided by teachers and parents in facilitating learning. However, the presence of pupils in the Fairly Satisfactory category highlights the need for targeted intervention programs, differentiated instruction, and academic enrichment to address varying learner needs and further improve performance. The findings support the study of Eta (2024), which concluded that the effective use of information and communication technology enhances students' learning experiences, strengthens study habits, and contributes positively to academic achievement.

Table 4
Level of Academic Performance of Grade Four Pupils as Revealed by Their Average Grades

Grades	Verbal Interpretation	F	%
90 and above	Outstanding	84	21.5
85 - 89	Very Satisfactory	110	28.2
80 - 84	Satisfactory	123	31.6
75 - 79	Fairly Satisfactory	73	18.7
below 75	Did not meet expectations	-	-
Total		390	100
Highest Grade		95	
Lowest Grade		75	
Mean		84.06 – Satisfactory	
Standard Deviation		7.310	

3.5 Significant Relationship Between the Perceived Extent of Effects of Technologies on the Behavior of Grade Four Pupils and Their Level of Academic Performance

Table 5 presents the computed r-values on the significant relationship between the perceived extent of the effects of technologies on the behavior of Grade Four pupils and their level of academic performance. The results revealed significant positive relationships across all behavioral aspects, with Enhanced Connectivity showing the strongest correlation ($r = 0.842$, $p = 0.001$), followed by Digital Addiction ($r = 0.795$, $p = 0.012$) and Social and Emotional Changes ($r = 0.694$, $p = 0.032$). Since all computed p-values were less than the 0.05 level of significance, the null hypothesis was rejected, indicating that the perceived effects of technology on pupils' behavior are significantly associated with their academic performance. These findings suggest that technology, when utilized for communication, collaboration, and learning, can positively influence pupils' academic achievement. Although digital addiction exhibited a significant positive relationship with academic performance, this may indicate that pupils' technology use includes educational activities rather than purely recreational purposes. The results underscore the importance of promoting purposeful and responsible technology use while

strengthening pupils' self-regulation and digital citizenship skills to maximize educational benefits and minimize potential behavioral risks. The findings are consistent with the study of Timbang and Velasco (2024), which reported that students' engagement with digital technology is significantly associated with improved academic performance, emphasizing that effective and guided technology use enhances both learning experiences and educational outcomes.

Table 5

Significant Relationship Between the Perceived Extent of Effects of Technologies on the Behavior of Grade Four Pupils and Their Level of Academic Performance

Aspects	r-values	p-values	Ho	Verbal Interpretation
Digital Addiction	0.795	0.012	Rejected	Significant
Social and Emotional Changes	0.694	0.032	Rejected	Significant
Enhanced Connectivity	0.842	0.001	Rejected	Significant

Conclusions & Recommendations

The study concluded that technologies have a high overall effect on the behavior of Grade Four pupils, with enhanced connectivity having the greatest influence, followed by social and emotional changes, while digital addiction showed a moderate effect. The perceived effects of technology did not significantly differ according to sex, sibling position, and number of children in the family but varied significantly based on monthly family income, parents' educational attainment, and parents' occupation. Moreover, the pupils generally demonstrated a satisfactory level of academic performance, and a significant positive relationship was found between the perceived effects of technology on behavior and academic performance. These findings indicate that while technology serves as an important educational and communication tool, its influence on learners is shaped largely by family socioeconomic and educational factors, highlighting the need for balanced and responsible technology use.

Based on these findings, it is recommended that schools implement intervention programs that promote responsible digital citizenship, balanced technology use, and healthy online behaviors while maximizing technology's educational benefits. Teachers and parents should strengthen their collaboration in monitoring pupils' technology use and guiding them toward productive digital activities that support academic learning. Schools may also provide digital literacy initiatives and equitable access to educational technologies, particularly for learners from less advantaged socioeconomic backgrounds. Finally, future researchers are encouraged to conduct similar studies involving other grade levels, additional behavioral and environmental variables, and different educational settings to further validate and expand the findings of the present study.

Compliance with ethical standards

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