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Teachers' Practices on Digital Infrastructure towards Schools' Digital Capacity and Transformation

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Abstract
Digital infrastructure impacts teaching practices and school reform, leading to better access and use of educational resources. This study investigates the teachers' practices on digital infrastructure toward schools' digital capacity and transformation aimed to evaluate respondents' digital infrastructure, schools' capacity, teachers' practices' impact on digital infrastructure, and the relationship between these factors and their characteristics among teachers of Initao District, during the School Year 2023-2024. A stratified random sampling of 200 elementary and secondary school teachers/respondents employed a patterned and modified questionnaire using descriptive statistics, such as frequency, percentage, mean, and standard deviation, to describe the variable in the study. Furthermore, Pearson's correlation (r) and t-test were also employed to determine the relationships and each difference in the variables used in the study. This study applied a quantitative research method on numerical data and statistical analysis to investigate the relationships between variables and describe the characteristics of the sample population.
The result shows that most respondents were 26–35 years old, female, married, with MA units, 6-15 years of teaching experience, teacher 1 in position, and attended training at the district/school level. The study indicates high practices in digital capacity for teaching effectiveness, while the school's digital capacity and transformation are highly regarded in terms of teachers' attributes and professional development. Access to digital infrastructure, digital pedagogical skills, technical support, infrastructure maintenance, and teaching effectiveness significantly affect digital capacity and transformation. At the same time, the highest educational attainment and training/seminars attended on digital infrastructure showed a significant relationship towards teaching effectiveness and their profiles. The study concludes that there is a direct link between effective teaching and appropriate use of digital resources; hence, there is a vital importance of teacher training and continuous support in fully harnessing the benefits of digital infrastructure in education. It is recommended that schools prioritize teacher training, increased funding, improved digital literacy, and collaborative curriculum alignment for effective technology integration.

Keywords: Digital Infrastructure, Schools' Digital Capacity, And Transformation

1. Introduction

This study explores the challenges and opportunities of digital infrastructure and transformation in schools, with a focus on the Initao District of Misamis Oriental. While technology has the potential to enhance teaching and learning, many schools face barriers such as limited resources, weak internet

connectivity, inadequate teacher preparation, and unequal student access to digital tools. Teachers' digital competence, psychological factors affecting learners, and sustainability of digital practices are also concerns.

Despite these challenges, ICT integration can improve student engagement, instructional quality, and school administration when effectively implemented. Digital transformation aims to create inclusive, efficient, and innovative learning environments, but success depends on factors like infrastructure availability, teacher readiness, and stakeholder support. In rural Philippine schools, these issues are intensified by connectivity gaps and resource constraints.

The study seeks to address these gaps by examining teachers' practices in digital infrastructure and identifying variables that influence schools' digital capacity and transformation.

Research Questions

This study aimed to determine the level of teachers' practices on digital infrastructure towards schools' digital capacity and transformation among public elementary and secondary school teachers in the District of Initao, Division of Misamis Oriental, during the School Year 2023-2024.

Specifically, this study sought to answer the following questions:

1. What is the respondents' characteristics in terms of age, sex, civil status, highest educational attainment, teaching experience, position, and training/seminars attended on digital infrastructure?
2. What is the respondents' level of practices on digital infrastructure, considering access to digital infrastructure, digital pedagogical skills, technical support, infrastructure maintenance, and teaching effectiveness?
3. What is the respondents' level of schools' digital capacity and transformation based on digital competencies, personal attributes and professional development, socioeconomic school context and emergencies, and connectivity, infrastructure and government support?
4. Is there a significant effect of the respondents' practices on digital infrastructure towards schools' digital capacity and transformation?
5. Is there a significant relationship between the respondents' practices on digital infrastructure and each of their characteristics?

Significance

The study's results benefited multiple stakeholders. School administrators gained awareness of their current digital infrastructure, using the findings to identify strengths, weaknesses, and areas for improvement in teaching and learning. Teachers enhanced their digital literacy and optimized classroom resources to improve instruction. Parents appreciated the increased accessibility of education through teachers' use of digital tools, while students recognized the value of these resources in enhancing their learning. Finally, future researchers may use the study as a foundation for further investigations on digital infrastructures in other educational institutions, leading to broader and more generalizable findings.

Scope and Limitations

This study delved into the teachers' practices on digital infrastructure towards schools' digital capacity and transformation among the public-school teachers of Initao District, Division of Misamis Oriental, School Year 2023-2024. The study's respondents were the two hundred (200) public elementary and secondary school teachers. The independent variables are limited only to practices on digital infrastructure, such as access to digital infrastructure, digital pedagogical skills, technical support, infrastructure maintenance, and teaching effectiveness. Further, the dependent variables are also limited to schools' digital capacity and transformation based on digital competencies, personal attributes,

professional development, socioeconomic school context, emergencies, connectivity, infrastructure, and government support. Moreover, the respondents' age, sex, civil status, highest educational attainment, teaching experience, position, and training/seminars attended on digital infrastructure are considered essential in this study.

2. Literature Review

Respondent's Characteristics

Information and communication technology (ICT) plays a vital role in improving teaching and learning by providing diverse methods and fostering autonomy among learners, including those with hearing impairments (Rehman et al., 2024). Teacher-related factors such as age, experience, and training significantly influence their ICT competence. For example, younger and more experienced teachers often display higher responsiveness in classroom interaction styles, reflecting how personal characteristics affect teaching approaches (Chocarro et al., 2023). In addition, access to ICT-related seminars and digital infrastructure further develops teachers' competence, yet findings reveal that home internet access contributes more to students' digital literacy than school-based facilities (Joshkun et al., 2024). These insights underscore the importance of both teacher preparation and equitable access to digital resources in ensuring successful digital transformation in education.

Practices on Digital Infrastructure

Digital technologies have transformed education, but many schools still face challenges such as limited infrastructure, inadequate teacher preparation, and unequal access. Access to reliable digital infrastructure is vital for effective ICT integration, yet successful transformation also depends on teacher competence in digital pedagogy and continuous professional development (Timotheou et al., 2022). Proper management and maintenance of facilities further support quality teaching and learning (Elfina et al., 2022). Teaching effectiveness is influenced by factors such as experience and training, though teachers often underestimate their own efficacy. Overall, achieving meaningful digital transformation requires not only infrastructure investment but also strong teacher skills, support systems, and sustainable practices.

School's Digital Capacity and Transformation

Digital transformation in education requires both robust infrastructure and competent teachers. Teachers' digital skills, strengthened through experience, training, and continuous professional development, are crucial for effective ICT integration in the classroom (Vuorikari et al., 2022). At the same time, equitable access to resources and strong institutional support are necessary to maximize the potential of digital tools for teaching and learning (Haleem et al., 2022). Furthermore, adaptability and collaboration among teachers contribute significantly to the successful use of technology in education (Bardach et al., 2022).

3. Methodology

Research Design

This study utilized a descriptive-correlational research design to determine the relationship between teachers' practices on digital infrastructure such as access, pedagogical skills, technical support, maintenance, and teaching effectiveness and schools' digital capacity and transformation, which included competencies, professional development, socioeconomic context, connectivity, and government support. This design was considered most appropriate to achieve the study's objectives among public school teachers in Initao District, Division of Misamis Oriental, during SY 2023–2024.

Participants

The study's respondents were the two hundred (200) public elementary and secondary school teachers in the school where this study was conducted. These were teachers from nineteen (19) public elementary and secondary schools of the Initao District. The respondents included the Master Teachers and Teachers of elementary, junior high, and senior high school from Aluna Elementary School, Casilihon Elementary School, Initao Central School, Jampason Elementary School, Kalacapan Elementary School, Kamelon Elementary School, Kanitoan Elementary School, Oguis Elementary School, Pagahan Elementary School, Pontacon Elementary School, San Pedro Elementary School, Sinalac Elementary School, Tagpaco Elementary School, Tubigan Elementary School, Andales Integrated School, Gimangpang Integrated School, Tawantawan Integrated School, Initao National Comprehensive High School, and Kalacapan National High School. Out of three hundred two (302) teachers, two hundred (200) were the final respondents in the study.

Data Collection

The study employed a researcher-made questionnaire composed of three parts. Part I gathered respondents' demographic profile such as age, sex, civil status, educational attainment, position, teaching experience, and training on digital infrastructure, patterned after the study of Espinosa and Pañares (2023). Part II assessed teachers' practices on digital infrastructure in terms of access, pedagogical skills, technical support, maintenance, and teaching effectiveness, adapted from Derder et al. (2023) and rated on a four-point Likert scale. Part III measured schools' digital capacity and transformation, including digital competencies, professional development, socioeconomic context, connectivity, infrastructure, and government support, based on Timotheou et al. (2022), also using a four-point Likert scale.

Data Analysis

The collected data underwent a thorough collection, tabulation, and analysis process, employing various statistical methods for treatment and interpretation.

The researcher used descriptive statistics for Problems 1, 2, and 3. This involved calculating the average values (mean) and measures of variability (standard deviation) for the data collected from the respondents. Problem 4, Regression Analysis was used to determine the effect of the teachers' digital practices on schools' digital transformation and capacity, taking into account the moderating effect of the quality of the digital infrastructure.

For Problem 5, the Pearson Correlation Coefficient (r) was used to determine the significant relationship between the independent and dependent variables. Pearson's correlation coefficient played a substantial role in determining the strength and direction of the relationship between the two variables, enhancing the understanding of the research findings with more nuanced insights.

4. Results and Discussions

Problem 1. What is the respondents' characteristics in terms of age, sex, civil status, highest educational attainment, teaching experience, position, and training/seminars attended on digital infrastructure?

Table 1
Distribution of Respondents' Age

Category	Frequency	Percentage
56 years old and above	1	0.5
46-55 years old	25	12.5

36-45 years old	71	35.5
26-35 years old	96	48.0
25 years old and below	7	3.5
Total	**200**	**100.00**

Table 1shows that nearly half of the teachers surveyed are young, aged 26–35, indicating a workforce that is generally receptive to new teaching approaches and digital transformation initiatives. Their familiarity with technology and digital tools allows them to creatively and efficiently integrate these resources into their lessons, enhancing student learning and supporting the development of schools' digital capabilities. In contrast, older teachers, particularly those 56 and above, are underrepresented and may face challenges in adapting to new technologies, contributing to a digital skills gap. Nonetheless, experienced educators bring valuable knowledge and classroom expertise, and with adequate access to digital resources and training, they can also play a significant role in advancing digital transformation and engaging students effectively.

Table 2
Distribution of Respondents' Sex

Category	Frequency	Percentage
Male	65	32.5
Female	135	67.5
Total	**200**	**100.00**

Table 2 shows that the majority of teachers surveyed are female, comprising 67.5% of the sample, while males account for 32.5%. This reflects the predominance of women in the teaching profession in the Philippines, likely influenced by cultural expectations and societal norms. Female teachers demonstrated high technological self-efficacy, actively integrating digital tools into their lessons and contributing to improved student learning outcomes. In contrast, the lower number of male teachers may limit diverse perspectives and role modeling, potentially affecting digital integration strategies and mentorship opportunities for students. Overall, this gender distribution highlights both the strengths of a predominantly female teaching workforce in adopting technology and the need to address potential gaps caused by underrepresentation of male educators.

Table 3
Distribution of Respondents' Civil Status

Category	Frequency	Percentage
Single	56	28.0
Widowed	3	1.5
Separated	1	0.5
Married	137	68.5
Solo Parent	3	1.5
Total	**200**	**100.00**

Table 3 shows that the majority of teachers surveyed are married, comprising 68.5% of the sample, while separated teachers represent the smallest group at 0.5%. Married teachers often manage both job and family responsibilities, which may contribute to a stable, dedicated, and ethically committed approach to teaching, reflecting their focus on student well-being and professional growth. In contrast, single or separated teachers may experience unique challenges, such as balancing personal obligations with teaching duties, highlighting the need for additional support from school administration. Overall, the distribution of civil status provides insights into teachers' work-life balance, professional development needs, and well-being, which schools can consider when designing support systems and professional growth initiatives.

Table 4
Distribution of Respondents' Highest Educational Attainment

Category	Frequency	Percentage
Full-fledged PhD/EdD	0	0
With PhD/EdD units	3	1.5
Full-fledged MA	26	13.0
With MA units	98	49.0
Baccalaureate Degree	73	36.5
Total	**200**	**100.00**

Table 4 shows that nearly half of the teachers (49%) have completed or are pursuing Master's degree units, indicating a strong commitment to professional development and lifelong learning. This group demonstrates higher competencies in learning-to-learn and self-management skills compared to those with only a bachelor's degree, which can positively influence teaching methods and student learning outcomes. In contrast, only a small portion of teachers (1.5%) are pursuing doctoral degrees, reflecting the challenges of balancing advanced studies with the demands of the teaching profession. Overall, the data suggest that a Master's degree is a practical and common path for professional growth among teachers, equipping them with advanced pedagogical skills, specialized knowledge, and leadership capabilities that enhance their instructional effectiveness and contribution to the educational community.

Table 5
Distribution of Respondents' Teaching Experience

Category	Frequency	Percentage
36 years and above	0	0
26-35 years	2	1.0
16-25 years	30	15.0
6-15 years	86	43.0
5 years and below	82	41.0
Total	**200**	**100.00**

Table 5 shows that the largest group (43%) has 6–15 years of experience, indicating that most teachers are relatively early in their careers. These teachers often bring fresh perspectives, familiarity with contemporary pedagogical trends, and readiness to adopt new technologies, enhancing student learning

and classroom innovation. However, their limited practical experience may require support through mentorship, training, and access to digital tools to fully develop advanced competencies. In contrast, teachers with 26–35 years of experience are underrepresented, suggesting challenges in retaining highly experienced educators. While veteran teachers have extensive pedagogical knowledge and serve as mentors, they may face a digital proficiency gap due to limited exposure to technology. Addressing these gaps through targeted professional development can help bridge the divide, ensuring all teachers can effectively integrate digital tools into teaching practices.

Table 6
Distribution of Respondents' Position

Category	Frequency	Percentage
Master Teacher II	2	1.0
Master Teacher I	10	5.0
Teacher lII	41	20.5
Teacher II	14	7.0
Teacher l	133	66.5
Total	**200**	**100.00**

Table 6 shows that the majority of respondents (66.5%) hold the Teacher I position, indicating that most teachers are at the entry level and in the early stages of their careers. This prevalence suggests a hierarchical structure where mentorship and support play a significant role, but opportunities for upward mobility may be limited. Fewer teachers occupy advanced positions, such as Master Teacher II, which represent higher expertise, leadership, and experience, but are less involved in digitalization initiatives. This disparity highlights potential challenges in career advancement, access to professional development, and integration into digital teaching practices. The findings underscore the importance of creating clear pathways for teacher growth, providing training, and fostering supportive environments to help educators progress to higher roles, ultimately improving the overall quality of education.

Table 7
Distribution of Respondents' Trainings/Seminars Attended on Digital Infrastructure

Category	Frequency	Percentage
International	0	0
National	11	5.5
Regional	3	1.5
Division	74	37.0
District/School	112	56.0
Total	**200**	**100.00**

Table 7 shows that the majority (56%) participated in district- or school-level programs, indicating a strong commitment to digital transformation and professional development. These training programs equip teachers with essential skills to use digital tools effectively, apply interactive instructional strategies, manage digital resources, and foster students' digital citizenship. In contrast, participation in regional-level trainings was minimal (1.5%), highlighting limited access to broader professional development

opportunities. This disparity underscores the need for increased support, funding, and accessible training initiatives to ensure all teachers, regardless of experience or location, are prepared to enhance digital literacy in their classrooms. Comprehensive and targeted professional development is crucial for closing generational gaps, promoting equitable technology use, and creating engaging, inclusive learning environments.

Problem 2. What is the respondents' level of practices on digital infrastructures, considering access to digital infrastructure, digital pedagogical skills, technical support, infrastructure maintenance, and teaching effectiveness?

Table 8
Summary Distribution of the Respondents' Level of Practices on Digital Infrastructure

Variable	Mean	SD	Interpretation
Access to Digital Infrastructure	3.04	0.72	Practiced
Digital Pedagogical Skills	3.15	0.66	Practiced
Technical Support and Infrastructure Maintenance	2.88	0.69	Practiced
Teaching Effectiveness	3.17	0.66	Practiced
Overall	**3.06**	**0.68**	**Practiced**

Table 8 shows that teachers actively practice the use of digital infrastructure, with results indicating that digital tools enhance teaching effectiveness by supporting interactive learning, collaboration, and personalized feedback. While teachers generally perceive their digital skills as effective, variability exists, highlighting the need for continuous training and equitable access. The main challenge lies in technical support and infrastructure maintenance, where insufficient assistance disrupts lessons and discourages integration. For schools to maximize the benefits of digital transformation, they must provide reliable IT support, regular professional development, updated resources, and a culture of innovation to sustain effective and inclusive digital teaching practices.

Problem 3. What is the respondents' level of schools' digital capacity and transformation based on digital competencies, personal attributes and professional development, socioeconomic school context and emergencies, and connectivity, infrastructure and government support?

Table 9
Summary of the Respondents' Level of Schools' Digital Capacity and Transformation

Variable	Mean	SD	Interpretation
Digital Competencies	3.11	0.63	High
Personal Attribute and Professional Development	3.27	0.56	High
Socioeconomic School Context and Emergencies	3.01	0.65	High
Connectivity, Infrastructure, and Government Support	2.93	0.65	High

Overall	**3.08**	**0.62**	**High**

Table 9 shows that schools demonstrate a generally high level of digital capacity and transformation, with an overall mean of 3.08 (SD=0.62), reflecting active teacher integration of digital tools and institutional efforts to build supportive environments. Teachers' personal attributes and professional development obtained the highest mean (3.27), highlighting the strong role of continuous training and positive teacher attitudes in driving successful technology use, while connectivity, infrastructure, and government support received the lowest mean (2.93), indicating persistent gaps that hinder equal access to digital learning. The moderate variability in scores suggests that while many schools are excelling, others lag behind, underscoring the need for targeted interventions to ensure equitable access and support. The findings imply that strengthening infrastructure, providing consistent government backing, and fostering a culture of professional development are essential to sustaining effective digital transformation, thereby preparing students for a more technologically advanced learning environment.

Problem 4. Is there a significant effect of the respondents' practices on digital infrastructure towards schools' digital capacity and transformation?

Table 10

Regression Analysis on the Effect of the Respondents' Practices on Digital Infrastructure Towards Schools' Digital Capacity and Transformation

Practices on Digital Infrastructures	**Unstandardized Coefficients**		**Standardized Coefficients**		**Sig.**	**Interpretation**	**Overall Result**
	B	**Std. Error**	**Beta**	**t-value**			
Access to Digital Infrastructure	-.046	.060	-.047	4.856	.003	S	.003 S
Digital Pedagogical Skills	.300	.057	.316	5.267	.001	S	.001 S
Technical Support and Infrastructure Maintenance	.106	.047	.115	2.267	.000	S	.000 S
Teaching Effectiveness	.489	.057	.542	8.572	.025	S	.025 S

Table 10 reveals that teachers' practices on digital infrastructure significantly influence schools' digital capacity and transformation, as shown by the rejection of the null hypothesis with f- and p-values below the 0.05 level. Access to digital infrastructure, digital pedagogical skills, technical support, infrastructure maintenance, and teaching effectiveness all play vital roles in shaping successful technology integration. While access to computers, internet, and software is essential, it is not sufficient without proper training, technical assistance, and ongoing professional development to ensure effective use. Teachers' proficiency

in digital pedagogy enhances their confidence and motivation, leading to greater student engagement and encouraging schools to invest further in resources. Similarly, reliable technical support and maintenance ensure smooth use of digital tools, while teachers' belief in technology's positive impact on teaching effectiveness fosters a stronger commitment to digital transformation. These results emphasize that sustainable digital integration requires comprehensive strategies that combine access, support, training, leadership, and a culture of innovation to create more engaging, equitable, and effective learning environments.

Problem 5. Is there a significant relationship between the respondents' practices on digital infrastructure and their characteristics?

Table 11
Result of the Test on the Relationship Between the Teachers' Practices on Digital Infrastructure and Their Characteristics

Respondents' Characteristics	Practices on Digital Infrastructure				Overall
	Access to Digital Infrastructure R-value P- value Interpretation	Digital Pedagogical Skills R-value P- value Interpretation	Technical Support and Infrastructure Maintenance R-value P- value Interpretation	Teaching Effectiveness R-value P- value Interpretation	R-value P- value Interpretation
Age	0.031 0.665 NS	0.065 0.361 NS	-0.069 0.332 NS	0.173 0.014 NS	0.050 0.343 NS
Sex	-0.142 0.046 NS	0.028 0.696 NS	-0.121 0.087 NS	-0.95 0.181 NS	-0.082 0.253 NS
Civil Status	-0.178 0.012 NS	-0.065 0.360 NS	-0.116 0.102 NS	-0.114 0.109 NS	-0.118 0.146 NS
Highest Educational Attainment	-0.078 0.275 NS	0.064 0.366 NS	-0.035 0.627 NS	3.062 0.002 S	0.753 0.318 NS
Teaching Experience	-0.055 0.441 NS	-0.099 0.165 NS	-0.068 0.338 NS	-0.116 0.102 NS	-0.085 0.262 NS

Position	0.004 0.953 NS	0.103 0.145 NS	-0.092 0.194 NS	0.109 0.124 NS	0.031 0.354 NS
Training/ Seminars Attended on Digital Infrastructure	-0.050 0.479 NS	-0.132 0.063 NS	-0.033 0.646 NS	4.065 0.000 S	0.963 0.297 NS

Table 11 shows a significant relationship between teachers' digital practices and their characteristics, particularly highest educational attainment and training/seminars attended on digital infrastructure, indicating that these factors strongly influence teaching effectiveness and the successful use of digital tools. Teachers with higher education and those who have undergone training are more confident and skilled in integrating technology, creating interactive lessons, and fostering student engagement, which leads to improved learning outcomes and stronger support for digital transformation in schools. Conversely, no significant relationships were found between teaching effectiveness and demographic factors such as age, sex, civil status, teaching experience, or teaching position, suggesting that effective digital integration depends less on personal characteristics and more on institutional support, access to resources, and continuous professional development. These findings highlight the importance of providing reliable technology, sustained training, technical assistance, and a supportive culture of innovation to empower educators and maximize the impact of digital infrastructure on teaching and learning.

5. Conclusion and Recommendations

Conclusion

The study found that teaching effectiveness has been identified as the most significant factor in the successful integration of digital infrastructure within educational practices. The findings of the study clearly show a direct link between effective teaching and favorable results from the use of digital resources. This shows the vital importance of teacher training and continuous support in fully harnessing the advantages of digital infrastructure in education.

In addition, this study demonstrates that personal attributes and professional development are key factors driving successful digital capacity building and transformation within schools. Successful digital integration in education requires a holistic approach, investing in both teacher capabilities and targeted professional development.

Recommendations

Based on the results of the study, it is recommended that teachers attend training and pursue continuous professional development to strengthen their ability to integrate digital infrastructure and enhance teaching effectiveness. They should also develop technical support instructions for digital resources using proven and effective methods to ensure smooth and successful implementation in schools. Moreover, schools should receive increased government MOOE funding to upgrade digital infrastructure and address existing gaps. Teachers are encouraged to improve their digital literacy practices and regularly evaluate the

effectiveness of infrastructure to identify areas for necessary improvements. Finally, school administrators should take the lead, while teachers should actively participate in aligning digital infrastructure with curriculum goals to ensure meaningful and effective technology integration in teaching and learning.

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