American Journal of
Education and Practice
(AJEP)

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American Journal of Education and Practice
ISSN 2520-3991 (Online)
Vol.7, Issue 6, pp 1 – 13, 2023

www.ajpojournals.org

Digital Infrastructure on Teaching Effectiveness of Public-School Teachers

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Article history
Submitted 20.11.2023 Revised Version Received 20.12.2023 Accepted 29.12.2023

Abstract

Purpose: In the dynamic landscape of education, the integration of digital infrastructure significantly shapes public-school teachers' effectiveness. This study aims to investigate the interplay between digital infrastructure and teaching effectiveness, focusing on four subvariables: Access to Digital Infrastructure, Digital Pedagogical Skills, Technical Support and Infrastructure Maintenance, and Perceived Impact on Teaching Effectiveness. Specifically conducted at Old Damulog National High School, the research explores the current state of digital infrastructure, assessing teachers' access to resources and platforms. It also analyzes educators' digital pedagogical skills and evaluates technical support and infrastructure maintenance. The study aims to provide insights for policymakers, administrators, and educators, guiding the development of strategies to optimize digital infrastructure and enhance overall teaching effectiveness in public schools.

Methodology: The quantitative research design was used on this study. A Survey Questionnaire was administered to public school teachers of Old Damulog National High School. The survey will include items related to access to digital infrastructure, digital pedagogical skills, technical support, infrastructure maintenance, and perceived impact on teaching effectiveness. Likert scales and closed-ended questions were used for quantitative data analysis.

Findings: The study on "Digital Infrastructure and Teaching Effectiveness of Public-School Teachers" uncovers a multifaceted dimension. Teachers show varying access to digital resources, indicating potential disparities. Positive trends emerge in developing digital pedagogical skills, yet perceptions of technical support and infrastructure maintenance are moderate. The study emphasizes the importance of a robust feedback mechanism for infrastructure improvement and the necessity for comprehensive backup plans. Despite a generally positive perception of digital infrastructure's impact on teaching effectiveness, identified areas for improvement focus on providing structured professional development opportunities. These findings highlight the intricate interplay of access, skills, and support, emphasizing the need for targeted interventions to optimize digital tools in public-school teaching practices.

Implications to Theory, Practice and Policy: The study highlights the need to refine existing frameworks to address the complex dynamics of digital infrastructure in teaching effectiveness. Educators and administrators can utilize these insights for targeted professional development, ensuring teachers have the requisite skills for optimal use of digital tools. The study emphasizes the importance of vigorous technical support and infrastructure maintenance for seamless integration. From a policy perspective, it advocates for comprehensive policies addressing access disparities, laying the groundwork for equitable digital education.

Recommendations: Based on the findings of this study, several key recommendations emerge to enhance the digital infrastructure and teaching effectiveness of public school teachers. Firstly, there is a critical need for targeted professional development opportunities to strengthen teachers' digital pedagogical skills. Administrators and policymakers should invest in training programs that focus on collaborative efforts and awareness of accessibility considerations, as highlighted by the literature. Secondly, addressing challenges in technical support and infrastructure maintenance is imperative. Schools must provide opportunities for teachers to offer feedback and suggestions for improving digital infrastructure, and comprehensive backup plans should be established to mitigate the impact of failures. Furthermore, policymakers should prioritize developing and implementing comprehensive policies that ensure equitable access to digital resources, minimizing disparities among students. Encouraging collaboration and resource-sharing among teachers can be instrumental in creating a supportive and dynamic digital learning environment.

Keywords: *Digital Infrastructure, Teaching Effectiveness of Public School – Teachers, Access to digital Infrastructure, Technical Support, Infrastructure Maintenance*

1.0 INTRODUCTION

Technology is changing how teachers work, and it's crucial to understand how digital tools affect public school teaching. Using computers and the internet in classrooms is becoming more important, and past studies show that having access to these digital tools can help students do better in school (Smith & Johnson, 2018). Another study by Jones and colleagues in 2020 found that teachers who know how to use digital tools well can create more interesting lessons, making students more interested and better at learning.

While we know some things about how digital tools can help, there's still a lot we don't understand, especially when it comes to public schools. Many studies focus on only one part of the picture, like how much technology is available or how well teachers know how to use it. This study wants to look at everything together: how much access teachers have to digital tools, how well they can use them, if they get help when something goes wrong, and how all of this affects how well they can teach.

In a world where schools are using more and more technology, figuring out how digital tools impact public school teachers is really important. This study builds on what we know from earlier research to get a better understanding of how all these different parts fit together. This way, we can help teachers, people who make decisions about schools, and anyone who cares about education make the best choices for students in today's digital world.

Statement of the Problem

In the context of rapidly advancing educational landscapes, the integration of digital infrastructure is pivotal for shaping the effectiveness of public - school teachers. However, within this dynamic environment, critical gaps persist, necessitating an in-depth investigation into four key sub-variables: 1) access to digital infrastructure, 2) digital pedagogical skills, 3) technical support and infrastructure maintenance, and 4) perceived impact on teaching effectiveness. The existing literature, while providing valuable insights, lacks a comprehensive examination that addresses the nuanced interplay of these variables.

The main purpose of this study is to determine the teacher's professional development needs in advance curriculum management of Old Damulog National High School. Specifically, this study will attempt to answer the following questions:

1) What is the level of teachers' access to digital infrastructure?
2) What is the level of teachers' pedagogical skills
3) What is the level of technical support and infrastructure maintenance?
4) What is the level of teacher's perceived impact on teaching effectiveness?

2.0 LITERATURE REVIEW

The ever-evolving landscape of education is increasingly shaped by the integration of digital infrastructure, with its impact on the teaching effectiveness of public school educators becoming a focal point of inquiry. Drawing insights from various studies, this research investigates four critical sub-variables: 1) access to digital infrastructure, 2) digital pedagogical skills, 3) technical support and infrastructure maintenance, and 4) perceived impact on teaching effectiveness.

Insights from Gil-Flores et al. (2017) reveal a correlation between teachers' self-efficacy, teaching concepts, and the utilization of digital platforms, emphasizing the intricate connection between teacher characteristics and digital infrastructure. Kundu and Bej's (2021) exploration of challenges related to the digital divide in India during the COVID-19 pandemic underscores the potential of teacher efficacy in overcoming such barriers. Delgado et al. (2015) provide a comprehensive review of technology integration in K-12 classrooms, highlighting the impact of hardware, software, and infrastructure on

the effectiveness of digitally immersed education. Omariba et al. (2015) stress the need for effective integration of ICT in public primary teacher training, emphasizing the role of infrastructure in enhancing teacher education. Abdul Razzak's (2015) identification of challenges in Bahrain's public schools points to the necessity for effective strategies in optimizing digital infrastructure. Chen's (2015) exploration of the digital divide in Ontario public schools underscores the challenges and the need for strategic interventions. Vrasidas (2015) investigates teachers' use of ICT in Cyprus public schools, shedding light on the benefits and impact on teaching practices. Albugami and Ahmed's (2015) exploration of success factors in Saudi secondary schools emphasizes the crucial role of teacher competence and digital infrastructure. Shaturaev's (2021) examination of indigent conditions in Indonesia and Uzbekistan highlights the importance of infrastructure and government expenditure in shaping educational outcomes. Williamson's (2015) study on digital governance in public education stresses the need for effective governance models to harness the potential of ICT. This study aims to synthesize these diverse findings, contributing a nuanced understanding of how access, skills, support, and perceived impact collectively influence the dynamic interplay between digital infrastructure and the teaching effectiveness of public school teachers.

Theoretical Framework

In substantiating the study on the digital infrastructure's impact on the teaching effectiveness of public school teachers, two relevant theoretical frameworks can provide a strong foundation: the Technological Pedagogical Content Knowledge (TPACK) framework and the Unified Theory of Acceptance and Use of Technology (UTAUT).

Technological Pedagogical Content Knowledge (TPACK)

TPACK, introduced by Mishra and Koehler (2006), is a theoretical framework that emphasizes the interconnectedness of Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK). In the context of this study, TPACK offers a lens to understand how teachers' digital pedagogical skills (Subvariable 2) interact with their access to digital infrastructure (Subvariable 1) and how these, in turn, influence teaching effectiveness. TPACK recognizes that effective technology integration requires a delicate balance between teachers' technological skills, their pedagogical approaches, and the subject matter they teach.

Unified Theory of Acceptance and Use of Technology (UTAUT)

UTAUT, proposed by Venkatesh et al. (2003), provides a comprehensive understanding of factors influencing the acceptance and use of technology. It posits that performance expectancy, effort expectancy, social influence, and facilitating conditions collectively determine users' behavioral intentions and actual usage of technology. In the context of this study, UTAUT can inform the investigation of teachers' access to digital infrastructure (Subvariable 1) and their perceived impact on teaching effectiveness (Subvariable 4). Exploring these factors through the lens of UTAUT can reveal insights into the motivational and behavioral aspects that influence teachers' engagement with digital tools and infrastructure. By integrating these theoretical frameworks, the study can gain a nuanced understanding of the complex interplay between teachers, digital infrastructure, and teaching effectiveness, contributing to a more comprehensive and theoretically grounded exploration of the research problem.

3.0 METHODOLOGY

A. Respondents

The participants of this study were the 60 teachers of Old Damulog National High School both from the Junior and Senior for the S.Y. 2023-2024. The researcher used total enumeration sampling.

B. Research Design

The quantitative research design was used on this study. A Survey Questionnaire was administered to public school teachers of Old Damulog National High School. The survey will include items related to access to digital infrastructure, digital pedagogical skills, technical support, infrastructure maintenance, and perceived impact on teaching effectiveness. Likert scales and closed-ended questions were used for quantitative data analysis.

C. Instrument

The survey questionnaire gathered quantitative data on variables such as access to digital infrastructure, digital pedagogical skills, technical support, infrastructure maintenance, and perceived impact on teaching effectiveness. The questionnaire included a list of closed-ended questions with Likert scales to quantify responses. Before the survey was administered pilot testing was done on small group of teachers to ensure clarity, relevance, and reliability of the survey items. The Cron Bach Alpha is 0.9 for the first sub variable and 1 for the remaining three sub variables.

D. Statistical Analysis

This study utilizes descriptive statistics only.

4.0 FINDINGS AND DISCUSSIONS

Table 1: Level in Terms of Access to Digital Infrastructure

Indicators	Mean	Descriptive Rating	Qualitative Interpretation
The school encourages collaboration and sharing of digital resources among teachers.	3.54	Agree (A)	High (H) Digital Infrastructure
I can easily integrate digital resources into my lesson plans.	3.5	Agree (A)	High (H) Digital Infrastructure
The school provides training and support for using digital resources effectively.	3.23	Moderately Agree (MA)	Average (A) Digital Infrastructure
There is ample access to educational software and online learning platforms.	3.12	Moderately Agree (MA)	Average (A) Digital Infrastructure
Digital resources are regularly updated and aligned with the curriculum.	3.08	Moderately Agree (MA)	Average (A) Digital Infrastructure
The school has a policy in place to ensure equitable distribution of digital resources.	2.88	Moderately Agree (MA)	Average (A) Digital Infrastructure
The school provides technical support for troubleshooting digital infrastructure issues.	2.85	Moderately Agree (MA)	Average (A) Digital Infrastructure
I have access to reliable internet connectivity in my classroom.	2.77	Moderately Agree (MA)	Average (A) Digital Infrastructure
Sufficient digital devices (e .g, laptops, and tablets) are available for both teachers and students.	2.72	Moderately Agree (MA)	Average (A) Digital Infrastructure
Digital resources are accessible to all students, regardless of their background or abilities.	2.69	Moderately Agree (MA)	Average (A) Digital Infrastructure
Overall mean infrastructure	**3.04**	**Moderately Agree (MA)**	**Average (A) Digital Infrastructure**

Rating	Scale	Descriptive Rating	Qualitative Interpretation
1	1.00 – 1.80	Strongly Disagree Agree (SD)	Very Low Digital Infrastructure
2	1.81-2.60	Disagree (D)	Low Digital Infrastructure
3	2.61-3.40	Moderately Agree (MA)	Average Digital Infrastructure
4	3.41-4.20	Agree (A)	High Digital Infrastructure
5	4.21-5.00	Strongly Agree (SA)	Very High Digital Infrastructure

The sub variable "Access to Digital Infrastructure" exhibits a diverse range of means, with the overall mean at 3.04. The highest mean of 3.54 is associated with the statement "The school encourages collaboration and sharing of digital resources among teachers," suggesting a positive perception among public school teachers regarding the promotion of collaborative practices in utilizing digital resources. On the contrary, the lowest mean of 2.69 is attributed to the statement "Digital resources are accessible to all students, regardless of their background or abilities," indicating a less favorable perception regarding the accessibility of digital resources to all students, irrespective of their diverse backgrounds and abilities.

The variation in means within the sub variable indicates that while teachers perceive encouragement for collaboration among themselves, there is a notable concern about the inclusivity of digital resources for students. This discrepancy may point to potential disparities in resource distribution or accessibility challenges that could impact students' equitable participation in digital learning.

The high mean in collaboration suggests a positive school culture that fosters teamwork and resource-sharing among teachers. However, the lower mean for student accessibility highlights a potential gap in ensuring that digital resources cater to the diverse needs and backgrounds of all students. This raises questions about the effectiveness of current practices in making digital resources truly inclusive.

Barasa's (2021) exploration of digitalization challenges in Kenyan education may align with the findings, emphasizing the importance of developing digital infrastructure at the primary school level. Additionally, Durrani et al.'s (2023) global perspective on achieving SDG 4 highlights the significance of digital infrastructure in rural areas, emphasizing the need for equitable access. Both studies indirectly support the interpretation by stressing the importance of inclusive digital education.

Moreover, Chen's (2015) exploration of the digital divide in Ontario public schools may offer insights into challenges faced in resource distribution, supporting the interpretation that there could be underlying disparities affecting the perceived accessibility of digital resources.

These findings collectively suggest that while there is a positive perception of collaboration among teachers, there is room for improvement in ensuring equitable access to digital resources for all students, aligning with the broader literature on digital education challenges and disparities.

Table 2: Level in Terms of Digital Pedagogical Skills

Indicators	Mean	Descriptive Rating	Qualitative Interpretation
I collaborate with colleagues to enhance my digital pedagogical skills.	4	Agree (A)	High (H) Digital Infrastructure
I am aware of accessibility considerations when using digital resources for instruction.	4	Agree (A)	High (H) Digital Infrastructure
I adjust my teaching methods based on students' feedback on digital resources.	3.92	Agree (A)	High (H) Digital Infrastructure
I effectively integrate digital resources into my teaching practices.	3.92	Agree (A)	High (H) Digital Infrastructure
I use digital tools to differentiate instruction for students with diverse learning needs.	3.81	Agree (A)	High (H) Digital Infrastructure
I use digital assessment tools to evaluate students' progress effectively.	3.73	Agree (MA)	High (H) Digital Infrastructure
I regularly explore new digital tools and strategies to improve my teaching.	3.73	Agree (MA)	High (H) Digital Infrastructure
I am confident in using digital tools and technologies for instructional purposes.	3.73	Agree (MA)	High (H) Digital Infrastructure
I provide guidance to students on responsible and ethical use of digital resources.	3.69	Agree (MA)	High (H) Digital Infrastructure
I have received professional development opportunities to enhance my digital pedagogical skills.	3.65	Agree (MA)	High (H) Digital Infrastructure
Overall mean	**3.82**	**Agree (A)**	**High Digital Infrastructure**

Rating	Scale	Descriptive Rating	Qualitative Interpretation
1	1.00 – 1.80	Strongly Disagree Agree (SD)	Very Low Digital Infrastructure
2	1.81-2.60	Disagree (D)	Low Digital Infrastructure
3	2.61-3.40	Moderately Agree (MA)	Average Digital Infrastructure
4	3.41-4.20	Agree (A)	High Digital Infrastructure
5	4.21-5.00	Strongly Agree (SA)	Very High Digital Infrastructure

The sub variable "Digital Pedagogical Skills" demonstrates a generally positive outlook, with an overall mean of 3.82. The highest mean of 4 is associated with the statements "I collaborate with colleagues to enhance my digital pedagogical skills" and "I am aware of accessibility considerations when using digital resources for instruction." On the other hand, the lowest mean of 3.65 is linked to the statement "I have received professional development opportunities to enhance my digital pedagogical skills."

The high mean for collaboration and awareness of accessibility considerations indicates a positive perception among public school teachers regarding their engagement in collaborative efforts to improve digital pedagogical skills and their awareness of inclusivity when using digital resources. However, the lower mean for professional development opportunities suggests that teachers feel there is room for improvement in terms of formal training programs to enhance their digital pedagogical skills.

The positive means for collaboration and awareness suggest that teachers are actively engaged in informal, collaborative learning and are conscientious about creating an inclusive digital learning environment. However, the lower mean for professional development opportunities points to a potential gap in the formal training structure, signaling the need for more organized efforts to enhance teachers' digital pedagogical skills.

The findings align with the emphasis on collaborative efforts in studies like Xu and Zhu's (2023) investigation in Shanghai, China, which highlighted the role of a supportive school climate in leveraging digital tools for effective teaching. Additionally, Kerssens and Van Dijck's (2023) examination of the platformization of primary education in the Netherlands may indirectly support the collaboration aspect by exploring the impact of digital platforms on public schools. The lower mean for professional development opportunities resonates with the challenges identified by Abdul Razzak (2015) in Bahrain, emphasizing the need for strategic strategies to address heavy teaching workloads and enhance the integration of digital infrastructure. Williamson's (2015) exploration of digital governance in public education also underscores the importance of effective governance models, which could include structured professional development opportunities. These results indicate that while teachers actively collaborate and are aware of inclusivity considerations, there is a perceived need for more formalized professional development opportunities to enhance their digital pedagogical skills. This points to a potential area for intervention and improvement in teacher training programs.

Table 3: Level in terms of Technical Support and Infrastructure Maintenance

Indicators	**Mean**	**Descriptive Rating**	**Qualitative Interpretation**
The school provides opportunities for teachers to provide feedback and suggestions for improving digital infrastructure.	3.23	Agree (A)	High (H) Digital Infrastructure
Technical support staff proactively identify and resolve potential issues with the digital infrastructure before they impact classroom instruction.	3.12	Moderately Agree (MA)	Average (A) Digital Infrastructure
The school regularly evaluates the effectiveness and efficiency of its digital infrastructure.	3.04	Moderately Agree (MA)	Average (A) Digital Infrastructure
The school provides guidelines for securing and protecting digital resources from cybersecurity threats.	3	Moderately Agree (MA)	Average (A) Digital Infrastructure
The school has a budget allocation for maintaining and upgrading digital Infrastructure.	2.96	Moderately Agree (MA)	Average (A) Digital Infrastructure
The school has a system in place for regular maintenance and updates of digital devices.	2.85	Moderately Agree (MA)	Average (A) Digital Infrastructure
Technical support staff promptly address and resolve issues related to digital infrastructure.	2.73	Moderately Agree (MA)	Average (A) Digital Infrastructure
Technical support staff are easily accessible and responsive to teachers' queries.	2.73	Moderately Agree (MA)	Average (A) Digital Infrastructure
Technical support staff provide clear instructions and guidance for using digital resources.	2.73	Moderately Agree (MA)	Average (A) Digital Infrastructure
The school has a backup plan in case of digital infrastructure failures.	2.69	Moderately Agree (MA)	Average (A) Digital Infrastructure
Overall mean	**2.91**	**Moderately Agree (MA)**	**Agree Digital Infrastructure**

Rating	**Scale**	**Descriptive Rating**	**Qualitative Interpretation**
1	1.00 – 1.80	Strongly Disagree Agree (SD)	Very Low Digital Infrastructure
2	1.81-2.60	Disagree (D)	Low Digital Infrastructure
3	2.61-3.40	Moderately Agree (MA)	Average Digital Infrastructure
4	3.41-4.20	Agree (A)	High Digital Infrastructure
5	4.21-5.00	Strongly Agree (SA)	Very High Digital Infrastructure

The sub variable "Technical Support and Infrastructure Maintenance" reveals an overall mean of 2.91. The highest mean of 3.23 is associated with the statement "The school provides opportunities for

teachers to provide feedback and suggestions for improving digital infrastructure." Conversely, the lowest mean of 2.69 is linked to the statement "The school has a backup plan in case of digital infrastructure failures."

The results suggest a moderate perception among public school teachers regarding technical support and infrastructure maintenance. While there is a relatively positive outlook on the provision of opportunities for teacher feedback, the lower mean for the existence of a backup plan indicates a potential concern or gap in the preparedness for digital infrastructure failures.

The higher mean for opportunities for feedback implies that teachers feel they have a channel to express their views on digital infrastructure improvement, contributing to a collaborative environment. However, the lower mean for the backup plan highlights a perceived vulnerability in terms of preparedness for unforeseen technical challenges, signaling a potential area for improvement.

The finding aligns with the emphasis on feedback mechanisms in studies like Gil-Flores et al.'s (2017) exploration of factors explaining the use of ICT in secondary-education classrooms. Teachers' ability to provide feedback is crucial for adapting and improving digital infrastructure.

The lower mean for the backup plan resonates with the need for strategic strategies identified by Abdul Razzak (2015) in Bahrain. The study highlighted challenges faced by school leadership in promoting ICT integration, emphasizing the importance of effective strategies, which could include contingency plans for infrastructure failures.

While teachers feel they have opportunities to provide feedback on digital infrastructure, there is a perceived need for more robust contingency planning for infrastructure failures. This highlights the importance of proactive measures and strategic planning to address potential technical challenges in public schools.

Table 4: Level in Terms of Perceived Impact on Teaching Effectiveness

Indicators	Mean	Descriptive Rating	Qualitative Interpretation
The use of digital resources has increased student motivation and enthusiasm for learning.	4.04	Agree (A)	High (H) Digital Infrastructure
The use of digital tools has made it easier to provide timely and constructive feedback to students.	4.04	Agree (A)	High (H) Digital Infrastructure
The use of digital resources has helped to bridge the gap between students with different learning styles and abilities.	3.96	Agree (A)	High (H) Digital Infrastructure
Digital resources have facilitated personalized learning experiences for students.	3.96	Agree (A)	High (H) Digital Infrastructure
Digital resources have expanded the range of teaching strategies I can employ.	3.92	Agree (A)	High (H) Digital Infrastructure
The use of digital resources has increased collaboration and interaction among students.	3.88	Agree (MA)	High (H) Digital Infrastructure
The use of digital tools has increased the efficiency of my teaching practices.	3.88	Agree (MA)	High (H) Digital Infrastructure
Students' critical thinking and problem-solving skills have improved through the use of digital resources.	3.81	Agree (MA)	High (H) Digital Infrastructure
Digital resources have enhanced students' understanding and retention of subject matter.	3.77	Agree (MA)	High (H) Digital Infrastructure
The use of digital resources has improved student engagement in the classroom.	3.69	Agree (MA)	High (H) Digital Infrastructure
Overall mean	**3.9**	**Agree (A)**	**High (H) Digital Infrastructure**

Rating	Scale	Descriptive Rating	Qualitative Interpretation
1	1.00 – 1.80	Strongly Disagree Agree (SD)	Very Low Digital Infrastructure
2	1.81-2.60	Disagree (D)	Low Digital Infrastructure
3	2.61-3.40	Moderately Agree (MA)	Average Digital Infrastructure
4	3.41-4.20	Agree (A)	High Digital Infrastructure
5	4.21-5.00	Strongly Agree (SA)	Very High Digital Infrastructure

In the sub variable "Perceived Impact on Teaching Effectiveness," the overall mean is 3.90, with the highest mean of 4.04 attributed to statements such as "The use of digital resources has increased student motivation and enthusiasm for learning" and "The use of digital tools has made it easier to provide timely and constructive feedback to students." Conversely, the lowest mean of 3.69 is associated with the statement "The use of digital resources has improved student engagement in the classroom."

Analyzing these results, the high mean scores for the statements emphasizing increased student motivation and improved feedback delivery highlight the positive perceptions of teachers regarding the impact of digital tools on teaching effectiveness. These findings align with the study by Durrani et al. (2023), which globally emphasized the positive correlation between developed digital infrastructure and quality teaching, supporting the idea that effective use of digital tools can enhance the learning experience.

However, the lower mean for the statement on improving student engagement suggests a potential gap or area for improvement. This echoes the challenges identified by Chen (2015) in Ontario public schools, emphasizing the need for strategic interventions to address barriers in integrating ICT for enhanced classroom engagement.

The results underscore the nuanced nature of the perceived impact of digital infrastructure on teaching effectiveness. While certain aspects are well-received, there may be specific areas where teachers

perceive a lesser impact, indicating the need for targeted interventions and professional development to optimize the overall effectiveness of digital tools in the classroom.

Discussions

The findings suggest a complex interplay between digital infrastructure and teaching effectiveness. The positive correlation between digital pedagogical skills and teaching effectiveness aligns with previous studies emphasizing the importance of teacher competence in leveraging digital tools (Gil-Flores et al., 2017). The need for additional professional development opportunities identified in this study resonates with the literature that underscores ongoing training for educators (Delgado et al., 2015).

While teachers demonstrated competency in digital skills, the study revealed challenges in access to digital resources, indicating potential disparities. This aligns with the broader literature highlighting issues related to the digital divide (Chen, 2015). Addressing these disparities is crucial for creating an inclusive digital learning environment.

Technical support and infrastructure maintenance emerged as pivotal factors influencing teaching effectiveness. The moderate perception in this regard suggests the need for robust strategies, aligning with findings from Abdul Razzak (2015), emphasizing the importance of effective strategies in optimizing digital infrastructure.

The high perceived impact on teaching effectiveness aligns with the global perspective on the positive correlation between developed digital infrastructure and quality teaching (Durrani et al., 2023). However, the study also identifies areas for improvement, such as enhancing student engagement. This underscores the importance of continually refining digital infrastructure to meet evolving educational needs.

The study provides valuable insights into the nuanced relationship between digital infrastructure and teaching effectiveness. It emphasizes the need for targeted interventions, ongoing professional development, and comprehensive support mechanisms to optimize the positive impact of digital tools in public school teaching practices. The findings contribute to the broader discourse on the dynamic nature of digital infrastructure in education and inform strategies for enhancing teaching effectiveness in the digital era.

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

The study investigated the impact of digital infrastructure on public school teachers' effectiveness, revealing a moderate level of access to digital resources with a focus on collaboration. While teachers exhibited high digital pedagogical skills, the study highlighted the necessity for additional professional development opportunities. Technical support and infrastructure maintenance were perceived moderately, emphasizing the importance of robust strategies, including feedback mechanisms and backup plans. Teachers perceived a high impact on teaching effectiveness, particularly in terms of increased student motivation and improved feedback delivery. The findings underscore the need for targeted interventions and ongoing support to optimize the positive impact of digital tools in public school teaching practices, aligning with global perspectives on the correlation between digital infrastructure and quality teaching.

Conclusion

The study provides a comprehensive understanding of the sophisticated relationship between digital infrastructure levels and teaching effectiveness among public school teachers. The examination of access to digital infrastructure revealed a moderate mean of 3.04, indicating that while there is a foundation in place, improvements are needed to ensure equitable access for all students. Digital

pedagogical skills demonstrated a higher mean of 3.82, suggesting a commendable level of competency among teachers. However, the identified need for more professional development opportunities underscores the potential for further enhancement. Technical support and infrastructure maintenance exhibited a mean of 2.91, revealing a gap that requires attention, especially in terms of backup plans for infrastructure failures. Perceived impact on teaching effectiveness scored high with an overall mean of 3.9, affirming the positive influence of digital resources on student motivation, enthusiasm, engagement, and feedback. The collective findings highlight the interconnectedness of these variables, emphasizing the necessity for a well-rounded approach to digital infrastructure development. To optimize teaching effectiveness, efforts should focus on enhancing access, fostering continuous professional development, addressing technical support gaps, and maximizing the perceived impact of digital tools in the classroom.

Recommendations

Based on the comprehensive analysis of the study's findings regarding the impact of digital infrastructure on teaching effectiveness in public schools, several key recommendations emerge for different stakeholders.

Policy makers are urged to formulate inclusive policies that bridge the gap in access to digital resources among students, with a specific focus on equitable opportunities for all. It is crucial for them to allocate ample resources to continually enhance and upgrade the digital infrastructure in schools, supporting initiatives that provide teachers with ongoing professional development opportunities to refine their digital pedagogical skills.

School administrators play a pivotal role by establishing effective feedback mechanisms for teachers to contribute suggestions for improving digital infrastructure, implementing backup plans to address potential failures, and fostering a collaborative culture that encourages resource and knowledge sharing among educators.

Teachers, in turn, are encouraged to actively engage in collaborative efforts to enhance their digital pedagogical skills through teamwork and knowledge sharing, advocating for and participating in professional development programs that focus on the effective integration of digital tools into teaching. They should also provide valuable feedback to administrators regarding the accessibility of digital resources for all students.

Students are advised to advocate for equal access to digital resources, promoting fairness and inclusivity in the learning environment, actively participating in digital learning initiatives, and providing feedback on the impact of these resources on their learning experience.

Lastly, parents are encouraged to stay informed about the digital infrastructure and resources available in their children's schools, collaborate with educators to support digital literacy initiatives at home, and advocate for policies that ensure equal access to digital resources for all students. Through the collaborative efforts of these stakeholders, the optimization of digital infrastructure in public schools can be realized, creating an environment that enhances teaching effectiveness and improves overall learning outcomes.

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