

# Technology Leadership Techniques and Competencies and the Teaching Effectiveness of the New Millennium

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## Abstract

As technology continues to progress, different institution including schools, make use of its advantages. For this reason, technology leadership is a must in addition to different leadership styles adapted by the school heads. This study was designed to investigate the relationship of technology leadership techniques and competencies to teaching effectiveness.

This study on the relationship of technology leadership techniques and competencies of the school head and the teaching effectiveness of the teachers used descriptive correlational research design. It quantitatively measured the level of technology leadership techniques as to modeling and guidance, supply and support, evaluation and research, diffusion of innovation and communication and inspiration, and competencies as to visionary leadership and management, digital citizenship, systematic improvement, instructional expertise and problem solving ability of their respective school heads, and the effect of technology leadership to teaching effectiveness as to technical proficiency, competence, compassion and empathy, subject expertise, time management and students' engagement. The study revealed that technology leadership techniques and competencies have moderate to strong correlation to teaching effectiveness. The study also showed that educational leaders must embrace technological leadership to manage digital complexity, stimulate pedagogical innovation, and prepare students for 21st-century challenges. The result can be utilized to upscale technology leadership in broader scope and consequently, improve teaching effectiveness and students' achievement.

*Keywords:* technology leadership; leadership techniques; leadership competencies;

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## 1. Introduction

Leaders are at the front lines in an institution or organization. They are the organizational building elements that may make or break the success of their team, and this depends on the leadership techniques and style they apply as a leader. It is said that the capacity to exert influence on others and direct them toward the accomplishment of a shared objective or vision is essential to effective leadership. A leader who can invigorate and encourage their team, communicate clearly, and take responsibility for their actions is someone who may be considered a great leader.

Leadership styles are essential elements of organizational dynamics, covering the many ways and behaviors that leaders use to direct and exert influence on their teams in order to accomplish shared goals. The study and analysis of leadership styles is a topic that has been extensively researched and debated since it has a crucial impact on the culture, performance, and overall achievements of an organization. Leadership styles

span a broad range, including authoritarian and directive methods as well as collaborative, transformative, and servant leadership styles. Every style has unique benefits and possible disadvantages, influencing leaders' communication, decision-making, team motivation, and response to problems. Mastery of many leadership styles is crucial for leaders to adeptly respond to varied circumstances and the distinct requirements of their team members. One crucial challenge that a leader must confront is the rapid and continuous advancement of technology. Hence, aside from the leader's own style, a leader should be prepared to handle challenges brought on by technology, thus, he or she must adopt technology leadership. Educational technology leadership is characterized by the seamless integration of technological expertise and effective management skills to drive educational institutions forward (Chua, Chua, 2017),

Within an educational institution, technology leadership represents a powerful formation of educational pedagogy, administrative savvy, and cutting-edge technology. Whether a leader is a transformational, servant, or applying other leadership style, including technological leadership concepts is critical for improving teaching and learning in the digital era.

In today's quickly changing educational scene, technology has a significant impact on how students learn, instructors educate, and administrators administer the institution. The current digital technologies and resources provide unprecedented prospects for customization, collaboration, and information access, but their efficient implementation is dependent on intelligent leadership.

To manage the complexity of the digital world, foster pedagogical innovation, and guarantee that students are equipped for the demands of the twenty-first century, educational leaders must embrace technological leadership. This requires not just a thorough grasp of educational technology, but also the capacity to motivate instructors, engage students, and efficiently manage resources.

In this investigation, the researcher looked at how technological leadership might improve leadership styles in educational institutions. Whether one want to build a culture of collaboration, empowerment, or academic success, effective use of technology may help you fulfill your educational institution's goal and vision in an increasingly tech-driven world.

### *1.1 Statement of the problem*

The researcher aims to measure the relationship of technology leadership techniques and competencies of the school managers to the teaching effectiveness of the faculty, and answer the following questions:

1. What is the level of technology leadership techniques of the school heads as to
  - 1.1. modeling and guidance;
  - 1.2. supply and support;
  - 1.3. evaluation and research;
  - 1.4. diffusion of innovation and
  - 1.5. communication and inspiration?
2. What is the level of technology leadership competencies of the school heads in terms of
  - 2.1. visionary leadership and management;
  - 2.2. digital citizenship;
  - 2.3. systematic improvement;
  - 2.4. instructional expertise and
  - 2.5. problem-solving ability?
3. What is the effect of technology leadership on teaching effectiveness as to
  - 3.1. technical skills;
  - 3.2. competence;
  - 3.3. compassion and empathy;
  - 3.4. subject expertise;

3.5. time management and

3.6. students' engagement?

4. Is there a significant relationship between technology leadership techniques and teaching effectiveness?

5. Is there a significant relationship between technology leadership competencies and teaching effectiveness?

6. Singly or in combination, are technology leadership techniques and competencies significant predictors of the teaching effectiveness?

## 2. Methodology

The research design used in this study is Quantitative Research Design. As Dan Fleetwood (2023) stated, quantitative research is the examination and collection of numerical data to reveal patterns, compute means, assess relationships, and draw comprehensive insights. In addition, Divya Sreekumar (2023) said that this kind of study facilitates the examination of causal connections between variables, the formulation of predictions, and the extrapolation of findings to broader populations. The primary objective of quantitative research is to empirically examine a predetermined theory or hypothesis and thereafter either validate or invalidate it depending on the findings.

## 3. Results and Discussion

This chapter presents a comprehensive list of different results and discusses the findings obtained from the analysis of the collected data in this study. The subsequent tabular presentations and discussions will provide additional insights into the correlation between Technology Leadership Techniques and Competencies of School Heads and the Teaching Effectiveness in the 21st Century.

**Table 1** *Level of Technology Leadership Techniques of the School Head as to Modeling and Guidance.*

Statements	Mean	SD	Remarks
Actively mentors or guides teachers/faculty regarding technology integration in the classroom.	4.26	0.70	Always
Leads by example regarding ethical and responsible technology use in the school.	4.33	0.71	Always
Models best practices in the use of technology for educational purposes and consistently demonstrates behaviors aligned with the values of the organization.	4.25	0.73	Always

His/Her adaptability and resilience positively influence the team's ability to handle change and uncertainty.	4.29	0.69	Always
Provides guidance and direction in aligning technology initiatives with the school's overall educational goals.	4.25	0.7	Always

<b>Weighted Mean</b>	<b>4.28</b>
<b>Standard Deviation</b>	<b>0.71</b>
<b>Verbal Interpretation</b>	<b>Highly Proficient</b>

Table 1 displays the extent of technology leadership technique among school leaders in terms of modeling and guidance. The weighted mean of 4.28 (SD=0.71) indicates a "Highly Proficient" performance by the school leaders of the participating schools. "Leads by example regarding ethical and responsible technology use in the school" received the highest mean score of 4.33 (SD=0.71) followed by the statement "His/Her adaptability and resilience positively influence the team's ability to handle change and uncertainty" with a mean of 4.29 (SD=0.69), both of which received a remark of "Always". It suggests that the school heads give importance to ethical behavior and responsible users and models of using technology that positively influence his team in handling technological issues and welcome change gracefully.

**Table 2** *Level of Technology Leadership Techniques of the School Head as to Supply and Support.*

Statements	Mean	SD	Remarks
Supports teachers/faculty in staying updated with the latest educational technology trends and best practices.	4.29	0.75	Always
Provides technology resources and equipment for educational purposes.	4.19	0.80	Often
Responsive in addressing technology-related issues or challenges that arise in the school.	4.24	0.75	Always
Collaborates with teachers to understand their technology needs and challenges and provides relevant support.	4.26	0.78	Always
Fosters a culture that values and supports the use of technology among teachers/faculty and students.	4.27	0.74	Always

<b>Weighted Mean</b>	<b>4.25</b>
<b>Standard Deviation</b>	<b>0.77</b>
<b>Verbal Interpretation</b>	<b>Highly Proficient</b>

Table 2 displays the level of technology leadership techniques employed by school leaders in terms of the supply and support. The weighted mean of 4.25 (SD=0.77), along with the verbal interpretation of "Highly Proficient," indicates that the school leaders of the participating schools not only provide the required equipment and facilities for technological innovation, but also offer support in addressing school issues and challenges related to technology. The statement "Supports teachers/faculty in staying updated with the latest educational technology trends and best practices" received the highest mean of 4.29 (SD=0.75) which shows that the school heads ardently make sure that the teachers and students are updated with the latest educational technology trends and practices. This is closely followed by the statement "Fosters a culture that values and supports the use of technology among teachers/faculty and students" with a mean of 4.27 (SD=0.74). On the other hand, the statement "Provides technology resources and equipment for educational purposes" receives the lowest mean of 4.19 (SD=0.80) that has a remark of "Often".

**Table 3** *Level of Technology Leadership Techniques of the School Head as to Evaluation and Research.*

<b>Statements</b>	<b>Mean</b>	<b>SD</b>	<b>Remarks</b>
Conducts assessment or evaluation of technology integration in the classroom or school environment.	4.15	0.81	Often
Utilizes research and data to inform technology-related decisions and improvements.	4.13	0.83	Often
Encourages teachers to engage in educational technology research or participate in professional development related to research-based practices.	4.29	0.75	Always
Asks teachers/faculty to provide feedback or input on the technology-related decisions and improvements based on research and evaluation.	4.20	0.79	Always
Ensures that data is used to drive continuous improvement in technology initiatives	4.23	0.74	Always
<b>Weighted Mean</b>	<b>4.20</b>		
<b>Standard Deviation</b>	<b>0.79</b>		
<b>Verbal Interpretation</b>	<b>Highly Proficient</b>		

Table 3 presents the level of technology leadership technique among school leaders in relation to evaluation and research. Although there were some "Fairly Evident" remarks, this indicator still attained a high weighted mean of 4.20 (SD=0.79), suggesting a level of proficiency that is considered "Highly Proficient." The evaluation and research initiatives conducted by school leaders successfully evaluate the incorporation of technology within the school system. "Encourages teachers to engage in educational technology research or participate in professional development related to research-based practices" is the statement that receive the highest mean of 4.29 (SD=0.75), followed by the statement "Ensures that data is used to drive continuous improvement in technology initiatives" (M=4.23, SD=0.74) both of which receive a remark of "Always" while the statement that receive the lowest mean is "Utilizes research and data to inform technology-related decisions and improvements" (M=4.13, SD=0.83, Often). This implies that the school leaders give importance to research and faculty development and make use of the research data result in improving educational technology in their respective schools.

**Table 4** *Level of Technology Leadership Techniques of the School Head as to Diffusion of Innovation.*

Statements	Mean	SD	Remarks
Ensures that the introduction of new technologies aligns with the school's overall educational goals and vision	4.23	0.75	Always
Effectively communicates the benefits and value of innovative technology practices to the school community.	4.25	0.80	Always
Welcomes ideas for enhancing the introduction and implementation of innovative technological practices.	4.29	0.75	Always
Gathers insights and feedback on the success and challenges of technology adoption	4.25	0.78	Always
Consistently promotes the improvement of innovative ideas and the effective implementation of current technological practices inside the school.	4.28	0.74	Always
<b>Weighted Mean</b>		<b>4.26</b>	
<b>Standard Deviation</b>		<b>0.79</b>	
<b>Verbal Interpretation</b>		<b>Highly Proficient</b>	

As shown in Table 4, the level of school leaders' leadership technique as to diffusion of innovation is "Highly Proficient" with a weighted mean of 4.26, and standard deviation of 0.79 despite the fact that some statements received a remark of "Often". It is believed that integration of technology in the school was properly introduced. The statement on welcoming ideas for enhancing innovative technological practices receive the

highest mean score of 4.29 (SD=0.75) followed closely by the statement on promoting the improvement of innovative ideas with a mean of 4.28 (SD=0.74). These two statements received a remark of “Always”.

**Table 5** *Level of Technology Leadership Techniques of the School Head as to Communication and Inspiration.*

Statements	Mean	SD	Remarks
Inspires and motivates teachers to embrace technology in their teaching practices.	4.43	0.73	Always
Ensures that teachers feel empowered and confident in using technology tools and resources.	4.32	0.72	Always
Provides opportunities for open communication and feedback regarding technology issues and concerns.	4.32	0.78	Always
Fosters a sense of enthusiasm and curiosity among teachers/faculty and students regarding emerging technologies.	4.31	0.74	Always
Communicates technology-related updates, initiatives, and changes to the teachers/faculty and the school community.	4.33	0.75	Always
<b>Weighted Mean</b>		<b>4.34</b>	
<b>Standard Deviation</b>		<b>0.75</b>	
<b>Verbal Interpretation</b>		<b>Highly Proficient</b>	

A weighted mean of 4.34 (SD=0.75) and verbal interpretation of “Highly Proficient” show the level of school leaders’ technology leadership technique as to communication and inspiration as shown in Table 7. The five statements have close mean scores and all of which received a remark of “Always” where the statement “Inspires and motivates teachers to embrace technology in their teaching practices” has the highest mean of 4.43 (SD=0.73) while the statement on fostering a sense of enthusiasm receive the lowest mean of 4.31 (SD=0.74). This result suggests that the school heads inspire teachers to embrace technology in their classrooms, and open the line of communication on technology-related matters.

**Table 6** *Level of Technology Leadership Competencies of the School Head as to Visionary Leadership and Management.*

Statements	Mean	SD	Remarks
Articulates a clear vision for technology integration within the school's educational goals and objectives.	4.24	0.71	Strongly Agree
Future-oriented in adopting and integrating emerging technologies into the school's educational practices.	4.26	0.71	Strongly Agree
Oversees the maintenance and development of the school's technology infrastructure.	4.28	0.77	Strongly Agree
Builds and nurtures educators and support staff capable of implementing and supporting technology initiatives	4.26	0.79	Strongly Agree
Introduces effective or well-executed technology management practices and strategies.	4.19	0.76	Agree
<b>Weighted Mean</b>		<b>4.24</b>	
<b>Standard Deviation</b>		<b>0.75</b>	
<b>Verbal Interpretation</b>		<b>Highly Competent</b>	

Table 6 shows the level of school leaders' technology leadership competencies as to visionary leadership and management. It is shown by the weighted mean of 4.24 (SD=0.75) and verbal interpretation of "Highly Competent" that the school leaders have clear vision when it comes to technology integration to school goals and objectives and manage them well. The respondents agree that their school heads oversee the maintenance and development of the school's technology infrastructure receiving the highest mean of 4.28 (SD=0.77) while introducing of effective or well-executed technology management practices and strategies received the lowest mean of 4.19 (SD=0.76).

**Table 7** Level of Technology Leadership Competencies of the School Head as to Digital Citizenship.

Statements	Mean	SD	Remarks
Has a clear understanding of the digital world.	4.32	0.70	Strongly Agree



Proficient in using common digital tools such as email, word processing software, and spreadsheets	4.32	0.72	Strongly Agree
Knowledgeable and capable of leading professional development on technology.	4.31	0.73	Strongly Agree
Integrates educational technology tools and resources into administrative tasks, operations, and learning within the school.	4.32	0.69	Strongly Agree
Stays informed about emerging educational technologies and their potential impact on student learning.	4.33	0.70	Strongly Agree
<b>Weighted Mean</b>	<b>4.32</b>		
<b>Standard Deviation</b>	<b>0.71</b>		
<b>Verbal Interpretation</b>	<b>Highly Competent</b>		

The statements in Table 7 have close mean scores which all received a remark of “Always” and the school leader staying informed about the emerging educational technologies and their impact on students’ learning received the highest mean of 4.33 (SD=0.70). Overall, the level of technology leadership competencies of school heads as to digital citizenship received a mean score of 4.32 (SD=0.71) with a verbal interpretation of “Highly Competent”. This implies that the teachers believed that their school heads are digitally capable of leading the school in integrating technology in educational processes.

**Table 8** *Level of Technology Leadership Competencies of the School Head as to Systematic Improvement.*

Statements	Mean	SD	Remarks
Actively participates in the strategic planning for technology integration within the school.	4.32	0.74	Strongly Agree
Fosters a culture of continuous improvement in the use of technology for teaching and learning.	4.25	0.74	Strongly Agree
Encourages teachers and staff to reflect on and refine their use of technology in the classroom.	4.27	0.77	Strongly Agree

Uses data to assess the impact of technology initiatives on student learning outcomes and other school operational activities.	4.28	0.70	Strongly Agree
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Prioritizes investments in technology infrastructure, tools, and professional development to ensure sustained improvement	4.19	0.76	Agree
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<b>Weighted Mean</b>	<b>4.26</b>
<b>Standard Deviation</b>	<b>0.75</b>
<b>Verbal Interpretation</b>	<b>Highly Competent</b>

Table 8 shows the level of technology leadership competencies of school head as to systematic improvement with a mean of 4.26 (SD=0.75) and verbal interpretation of “Highly Competent”. The statement “Actively participates in the strategic planning for technology integration within the school” has the highest mean of 4.32 (SD=0.74) with a remark of “Strongly Agree” followed by “Uses data to assess the impact of technology initiatives on student learning outcomes and other school operational activities” (M=4.28, SD=0.70, “Strongly Agree”) and the statement “Prioritizes investments in technology infrastructure, tools, and professional development to ensure sustained improvement” received the lowest mean of 4.19 (SD=0.76, “Agree”).

**Table 9** *Level of Technology Leadership Competencies of the School Head as to Instructional Expertise.*

Statements	Mean	SD	Remarks
Creates a learning environment that fosters individualized student growth through technology.	4.29	0.74	Strongly Agree
Actively participates in the development and implementation of instructional strategies with the use of technology within the school.	4.28	0.75	Strongly Agree
Ensures that technology is used to enhance and not replace effective pedagogical strategies.	4.28	0.76	Strongly Agree
Ensures that technology is integrated seamlessly into the curriculum to enhance learning outcomes.	4.26	0.75	Strongly Agree
Collaborates with the teachers to identify and implement technology-enhanced learning materials.	4.24	0.79	Strongly Agree

<b>Weighted Mean</b>	<b>4.27</b>
<b>Standard Deviation</b>	<b>0.76</b>
<b>Verbal Interpretation</b>	<b>Highly Competent</b>

It is shown in Table 9 the level of technology leadership competencies of school heads as to instructional expertise. The overall mean score of 4.24 (SD=0.76) received a verbal interpretation of “Highly Competent”. The teachers observed that their leaders create a learning environment that fosters individualized student growth through technology receiving the highest mean of 4.29 (SD=0.74, “Strongly Agree”). The respondents perceived that their heads collaborate with teachers to identify and implement technology-enhanced learning materials although it received the lowest mean of 4.24 (SD=0.79) it still received a remark of “Strongly Agree”.

**Table 10** *Level of Technology Leadership Competencies of the School Head as to Problem Solving Ability.*

<b>Statements</b>	<b>Mean</b>	<b>SD</b>	<b>Remarks</b>
Recognizes and analyzes challenges or issues related to technology integration within the school.	4.25	0.74	Strongly Agree
Utilizes data and evidence to identify areas that require problem-solving in the use of technology in school operations and classroom instructions.	4.21	0.73	Strongly Agree
Collaborates with teachers, parents, and other stakeholders to address technology-related challenges.	4.28	0.79	Strongly Agree
Encourages teachers and staff to identify and communicate technology-related problems within the school community.	4.23	0.80	Strongly Agree
Sees to it that there is adequate resources and expertise available to address technology-related problems within the school.	4.25	0.75	Strongly Agree
<b>Weighted Mean</b>	<b>4.24</b>		
<b>Standard Deviation</b>	<b>0.76</b>		
<b>Verbal Interpretation</b>	<b>Highly Competent</b>		

Table 10 exhibits the level of technology leadership competencies of school heads as to problem-solving ability that received an overall mean of 4.24 (SD=0.76, “Highly Competent”). The school heads show collaboration with the teachers, students and other stakeholders in addressing technology-related challenges. This received the highest mean of 4.28 (SD=0.79, “Strongly Agree”). Although it received the lowest mean of

4.21 (SD=0.73, “Strongly Agree”), the head still believed to utilize data and evidence to identify areas that require problem-solving in the use of technology in school operations and classroom instructions. This can imply that the school head can identify and address technology-related challenges in their institution.

**Table 11** *Effect of Technology Leadership to Teaching Effectiveness as to Technical Proficiency.*

Statements	Mean	SD	Remarks
Adept in using common software applications, such as word processing, spreadsheets, and presentation tools.	4.46	0.65	Strongly Agree
Can troubleshoot basic technical issues related to hardware and software independently.	4.23	0.71	Strongly Agree
Integrates technology tools and resources into instructional activities like using multimedia in teaching to enhance content delivery.	4.48	0.62	Strongly Agree
Incorporates interactive elements (e.g., quizzes, polls, discussions) in delivering lessons.	4.43	0.69	Strongly Agree
Seeks out professional development opportunities to enhance technical skills for teaching, student engagement and learning outcomes.	4.36	0.69	Strongly Agree
<b>Weighted Mean</b>		<b>4.39</b>	
<b>Standard Deviation</b>		<b>0.68</b>	
<b>Verbal Interpretation</b>		<b>Highly Effective</b>	

It is exhibited in Table 11 the level of effect of technology leadership to teaching effectiveness as to technical proficiency which yielded a mean score of 4.39 (SD=0.68) which shows that the teachers are perceived to be “Highly Effective” when it comes to using basic technology in teaching. Integration of technology tools and resources in their instructional activities to enhance content delivery received the highest mean of 4.48 (SD=0.62, “Strongly Agree”) followed closely by being adept in using basic software application (M=4.46, SD=0.65, “Strongly Agree”) while troubleshooting basic technical issues received the lowest mean of 4.23 (SD=0.71, “Strongly Agree”). This displays that at this time, teachers believe that they are technical proficient especially in basic application and software that can be used in instructional activities.

**Table 12** *Effect of Technology Leadership to Teaching Effectiveness as to Competence.*

Statements	Mean	SD	Remarks
Designs and delivers lessons that effectively integrate technology to enhance student understanding and engagement.	4.47	0.63	Strongly Agree
Effectively manages and organizes classroom activities.	4.49	0.65	Strongly Agree
Adapts teaching methods to meet the diverse needs and learning styles of the students.	4.48	0.63	Strongly Agree
Demonstrate a strong ability to facilitate class discussions, answer questions, and engage students in the learning process.	4.53	0.63	Strongly Agree
Uses various teaching methods and resources that enhance learning experiences.	4.51	0.62	Strongly Agree
<b>Weighted Mean</b>		<b>4.50</b>	
<b>Standard Deviation</b>		<b>0.63</b>	
<b>Verbal Interpretation</b>		<b>Highly Effective</b>	

Table 12 shows the perceived level of effect of technology leadership to teaching effectiveness as to competence. The mean score of 4.50 (SD=0.63, “Highly Effective”) shows the assessed competence of teachers in the participating schools. The statement “Demonstrate a strong ability to facilitate class discussions, answer questions, and engage students in the learning process” received the highest mean score of 4.53 (SD=0.63, “Strongly Agree”) followed closely by the statement that shows that the teachers can use different teaching methods and resources that can enhance learning (M=4.51, SD=0.62, “Strongly Agree”) while the statement that affirm that teachers can design and delivers the lessons that integrate technology though received the lowest mean score of 4.47 (SD=0.63) shows that it is still “Strongly Agree” observed in the teachers’ performance.

**Table 13** *Effect of Technology Leadership to Teaching Effectiveness as to Compassion and Empathy.*

Statements	Mean	SD	Remarks
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Understands the individual needs and backgrounds of the students.	4.56	0.60	Strongly Agree
Makes an effort to learn about and acknowledge the personal challenges and experiences of the students.	4.50	0.61	Strongly Agree
Integrates social-emotional learning activities into the lessons to support students' emotional well-being.	4.52	0.60	Strongly Agree
Builds positive and trusting relationships within the class.	4.54	0.60	Strongly Agree
Collaborates with fellow teachers and staff to create a supportive and empathetic school environment.	4.56	0.65	Strongly Agree

<b>Weighted Mean</b>	<b>4.53</b>
<b>Standard Deviation</b>	<b>0.61</b>
<b>Verbal Interpretation</b>	<b>Highly Effective</b>

It is shown in Table 13 that the level of effect of technology leadership to teaching effectiveness as to compassion and empathy shows a mean of 4.53 with a standard deviation of 0.61 that has a verbal interpretation of "Highly Effective. This shows that the faculty members are perceived to be highly proficient in showing empathy and compassion to their students with the mean of all the five statements in this table are close with each other ranging from 4.50-4.56 and all which received a remark of "Strongly Agree". Two received the highest mean of 4.56, one shows that teachers are able to understand the needs and backgrounds of the students (SD=0.60) and the other indicates that the teachers can work hand in hand with their fellow teachers to create a supportive and empathic school environment.

**Table 14** *Effect of Technology Leadership to Teaching Effectiveness as to Subject Expertise.*

Statements	Mean	SD	Remarks
Stays updated on advancements and changes within the subject area.	4.48	0.60	Strongly Agree
Has expertise in the subject and positively influences students' understanding and learning of the course content.	4.50	0.62	Strongly Agree

Comfortable in addressing students' advanced or challenging questions within the subject area.	4.51	0.60	Strongly Agree
Explains and presents the subject matter clearly and comprehensively.	4.51	0.61	Strongly Agree
Incorporates real-world applications and examples from the subject area to make lessons more engaging and relevant for students.	4.53	0.59	Strongly Agree

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<b>Weighted Mean</b>	<b>4.51</b>
<b>Standard Deviation</b>	<b>0.60</b>
<b>Verbal Interpretation</b>	<b>Highly Effective</b>

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Table 14 shows the level of effect of technology leadership to teaching effectiveness as to subject expertise. The mean score of 4.51 (SD=0.60, "Highly Effective") shows the perceived subject expertise of teachers in the participating schools. The statements "Comfortable in addressing students' advanced or challenging questions" and "Explains and presents the subject matter clearly and comprehensively" both received a mean of 4.51 (Strongly Agree) with a standard deviation of 0.60 and 0.61 respectively while being updated in the advancement and changes in the subject area received the lowest mean score of 4.48 (SD=0.60, "Strongly Agree").

**Table 15** *Effect of Technology Leadership to Teaching Effectiveness as to Time Management.*

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Statements	Mean	SD	Remarks
Effectively manages class time to cover the planned course material.	4.53	0.63	Strongly Agree
Respects the scheduled start and end times of class.	4.51	0.64	Strongly Agree
Effectively balances the allocation of time for lectures, discussions, and activities.	4.50	0.65	Strongly Agree
Provides a clear course schedule and sticks to it, allowing students to plan their time effectively.	4.51	0.63	Strongly Agree

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Manages time in a way that ensures all course topics are adequately covered.	4.51	0.63	Strongly Agree
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<b>Weighted Mean</b>	<b>4.51</b>
<b>Standard Deviation</b>	<b>0.63</b>
<b>Verbal Interpretation</b>	<b>Highly Effective</b>

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It is shown in Table 15 the level of effect technology leadership has to teaching effectiveness as to time management. It is indicated in the table that it has a mean score of 4.51 (SD=0.63) based on the responses of the teacher-respondents and has a verbal interpretation of "Highly Effective". This implies that teachers have high proficiency when it comes to time management as an effect of technology leadership. This is especially evident in managing class time to cover the planned course material (M=4.53, SD=0.63, "Strongly Agree"). Although it received the lowest mean in the group, time management of teachers is still evident in balancing the allocated time for lectures, discussions, and activities (M=4.50, 0.65, "Strongly Agree").

**Table 16** *Effect of Technology Leadership to Teaching Effectiveness as to Students' Engagement.*

Statements	Mean	SD	Remarks
Creates a learning environment that encourages active participation and engagement.	4.58	0.60	Strongly Agree
Uses a variety of teaching methods and activities to keep students engaged.	4.58	0.59	Strongly Agree
Promotes class discussions and encourages students to ask questions and share their ideas.	4.58	0.60	Strongly Agree
Provides opportunities for group activities and collaboration, fostering student interaction.	4.60	0.57	Strongly Agree
Uses teaching style and communication that encourage students to actively participate in the learning process.	4.59	0.59	Strongly Agree
<b>Weighted Mean</b>	<b>4.58</b>		
<b>Standard Deviation</b>	<b>0.59</b>		
<b>Verbal Interpretation</b>	<b>Highly Effective</b>		



Shown in Table 16 is the level of effect of technology leadership to teaching effectiveness as to students' engagement with a mean of 4.58 with a standard deviation of 0.59 that has a verbal interpretation of "Highly Effective. This shows that the faculty members are perceived to be highly effective in encouraging students to engage in learning. Table 16 also shows that all the means of the five statements are close with each other ranging from 4.60-4.58 and all which received a remark of "Strongly Agree". The highest of which is the statement that shows that teachers provide opportunities for group activities and collaboration, fostering student interaction ( $M=4.60$ ,  $SD=0.57$ ).

**Table 17** Significant Relationship of Technology Leadership Techniques of School Heads to Teaching Effectiveness

Technology Leadership Techniques		Teaching Effectiveness					
		Technical Proficiency	Competence	Compassion and Empathy	Subject Expertise	Time Management	Students' Engagement
Modeling and Guidance	Correlation (r)	0.605*	0.527*	0.606*	0.554*	0.569*	0.532*
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000
	N	236	236	236	236	236	236
Supply and Support	Correlation (r)	0.558*	0.534*	0.581*	0.521*	0.524*	0.517*
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000
	N	236	236	236	236	236	236
Evaluation and Research	Correlation (r)	0.549*	0.457*	0.583*	0.415*	0.521*	0.452*
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000
	N	236	236	236	236	236	236
Diffusion of Innovation	Correlation (r)	0.600*	0.512*	0.632*	0.491*	0.615*	0.559*
	Sig. (2-tailed)	0.001	0.000	0.000	0.000	0.000	0.000
	N	236	236	236	236	236	236
Communication and Inspiration	Correlation (r)	0.591*	0.537*	0.656*	0.538*	0.584*	0.555*
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000
	N	236	236	236	236	236	236

Note: \*Correlation is significant at  $p < 0.025$  (2-tailed)

Legend:

Scale                      Degree of Correlation

$\pm 0.80 - \pm 1.00$       Very Strong

$\pm 0.60 - \pm 0.79$	Strong
$\pm 0.40 - \pm 0.59$	Moderate
$\pm 0.20 - \pm 0.39$	Weak
$\pm 0.10 - \pm 0.19$	Very Weak

To have an accurate and clear insight of the relationship between technology leadership techniques and teaching effectiveness a correlation analysis is used, shown in Table 17 at 95% confidence interval (2-tailed). The result shows that “Modelling and Guidance” is significantly correlated with all the aspects of teaching effectiveness ( $p < 0.025$ ), technical proficiency and compassion and empathy show strong correlation ( $r=0.605, 0.606$ ), while competence, subject expertise, time management and students’ engagement have moderate correlation ( $r=0.527, 0.554, 0.569, 0.532$ ).

“Supply and Support” is also significantly related to teaching effectiveness ( $p < 0.025$ ) having moderate correlation ( $r=0.558, 0.534, 0.581, 0.521, 0.524, 0.517$ ).

Technology leadership techniques as to evaluation and research is also significantly correlated ( $p < 0.025$ ) with teaching effectiveness as to technical proficiency, competence, compassion and empathy, subject expertise, time management and students’ engagement ( $r=0.549, 0.457, 0.583, 0.415, 0.521, 0.452$ ), all of which shows moderate correlation.

As to “Diffusion of Innovation”, three among the attributes of teaching effectiveness show strong correlation such as technical proficiency, compassion and empathy, and time management ( $r=0.600, 0.632, 0.615$ ) while the other three, namely competence, subject expertise and students’ engagement show moderate correlation ( $r=0.512, 0.491, 0.559$ ).

Lastly, “Communication and Inspiration” is significantly related to all the six elements of teaching effectiveness ( $p < 0.025$ ) which are technical proficiency, competence, compassion and empathy, subject expertise, time management and students’ engagement and all which show moderate correlation ( $r=0.591, 0.537, 0.656, 0.538, 0.584, 0.555$ ).

The relationship between technology leadership techniques and teaching effectiveness is integral to the successful integration of technology in education. Technology leadership techniques encompass various strategies such as strategic planning, professional development, resource allocation, and support structures. When implemented effectively, these techniques enable educators to leverage technology to enhance their teaching practices and improve student outcomes.

**Table 18** Significant Relationship of Technology Leadership Competencies of School Heads to Teaching Effectiveness

Technology Leadership Competencies		Teaching Effectiveness					
		Technical Proficiency	Competence	Compassion and Empathy	Subject Expertise	Time Management	Students' Engagement
Visionary Leadership and Management	Correlation (r)	0.571*	0.508*	0.593*	0.556*	0.534*	0.499*
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000
	N	236	236	236	236	236	236
Digital Citizenship	Correlation (r)	0.63*	0.586*	0.633*	0.594*	0.547*	0.56*
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000

	N	236	236	236	236	236	236
Systematic Improvement	Correlation (r)	0.602*	0.579*	0.647*	0.515*	0.54*	0.536*
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000
	N	236	236	236	236	236	236
Instructional Expertise	Correlation (r)	0.582*	0.574*	0.636*	0.526*	0.562*	0.536*
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000
	N	236	236	236	236	236	236
Problem Solving Ability	Correlation (r)	0.658*	0.62*	0.628*	0.595*	0.59*	0.559*
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000
	N	236	236	236	236	236	236

Note: \*Correlation is significant at  $p < 0.025$  (2-tailed)

Legend:

Scale	Degree of Correlation
$\pm 0.80 - \pm 1.00$	Very Strong
$\pm 0.60 - \pm 0.79$	Strong
$\pm 0.40 - \pm 0.59$	Moderate
$\pm 0.20 - \pm 0.39$	Weak
$\pm 0.10 - \pm 0.19$	Very Weak

Table 18 shows the result of the correlation analysis to show the significant relationship of technology leadership competencies to teaching effectiveness. At 95% confidence level (2-tailed), "Visionary Leadership and Management" is significantly correlated ( $p < 0.025$ ) to teaching effectiveness as to technical proficiency, competence, compassion and empathy, subject expertise, time management and students' engagement with moderate correlation ( $r = 0.571, 0.508, 0.593, 0.556, 0.534, 0.499$ ).

Digital citizenship is also shown to be significantly correlated ( $p < 0.025$ ) to teaching effectiveness as to technical proficiency and compassion and empathy having strong relationship ( $r = 0.63, 0.633$ ) and moderately correlated to competence, subject expertise, time management and students' engagement ( $r = 0.586, 0.594, 0.547, 0.56$ ).

Same as digital citizenship, Systematic Improvement is also significantly correlated ( $p < 0.025$ ) to teaching effectiveness as to technical proficiency and compassion and empathy having strong relationship ( $r = 0.602, 0.647$ ) and moderately correlated to competence, subject expertise, time management and students' engagement ( $r = 0.579, 0.515, 0.54, 0.536$ ).

On the other hand, "Instructional Expertise" has moderate significant correlation ( $p < 0.025$ ) to teaching effectiveness as to technical proficiency, competence, subject expertise, time management and students' engagement ( $r = 0.582, 0.574, 0.526, 0.562, 0.536$ ) and strong significant correlation with compassion and empathy ( $r = 0.636$ ).

Lastly, "Problem Solving Ability" is significantly correlated ( $p < 0.025$ ) to teaching effectiveness as to technical proficiency, competence and compassion and empathy with strong correlation ( $r = 0.658, 0.62, 0.628$ ) and moderate correlation to subject expertise, time management and students' engagement ( $r = 0.595, 0.59, 0.559$ ).

The relationship between technology leadership competencies and teaching effectiveness is fundamental to the successful integration of technology in education. When technology leaders possess these competencies, they are better equipped to support educators in leveraging technology to enhance their teaching practices and improve student outcomes.

**Table 19** *Technology Leadership Techniques as Significant Predictors of the Teaching Effectiveness*

<b>Technical Proficiency</b>						
		<b>B</b>	<b>SE</b>	<b><math>\beta</math></b>	<b><i>t</i></b>	<b><i>p</i></b>
(Constant)		1.8976	0.205		9.26	0.000
Modeling and Guidance		0.2609	0.0894	0.292	2.92	0.004
Supply and Support		0.0965	0.0765	0.116	1.26	0.208
Evaluation and Research		-0.1094	0.0985	-0.135	-1.11	0.268
Diffusion of Innovation		0.2083	0.1077	0.265	1.93	0.054
Communication and Inspiration		0.1237	0.0926	0.146	1.34	0.183
R Squared	0.412					
Adjusted R Squared	0.399		0.4506			
F (5, 231)	32.4					0.000
<b>Competence</b>						
		<b>B</b>	<b>SE</b>	<b><math>\beta</math></b>	<b><i>t</i></b>	<b><i>p</i></b>
(Constant)		2.2419	0.2141		10.473	0.000
Modeling and Guidance		0.1882	0.0934	0.213	2.015	0.045
Supply and Support		0.229	0.0799	0.278	2.865	0.005
Evaluation and Research		-0.1908	0.1028	-0.239	-1.855	0.065
Diffusion of Innovation		0.0915	0.1125	0.118	0.813	0.417
Communication and Inspiration		0.2042	0.0967	0.244	2.111	0.036
R Squared	0.343					
Adjusted R Squared	0.329		0.4706			
F (5, 231)	24.1					0.000
<b>Compassion and Empathy</b>						
		<b>B</b>	<b>SE</b>	<b><math>\beta</math></b>	<b><i>t</i></b>	<b><i>p</i></b>
(Constant)		2.1123	0.1831		11.537	0.000
Modeling and Guidance		0.1088	0.0799	0.131	1.362	0.174
Supply and Support		0.0828	0.0684	0.1066	1.211	0.227
Evaluation and Research		-0.0675	0.0879	-0.0897	-0.767	0.444
Diffusion of Innovation		0.1542	0.0962	0.2105	1.603	0.11
Communication and Inspiration		0.2834	0.0827	0.3597	3.425	0.000
R Squared	0.458					

Adjusted R Squared	0.446		0.4025			
F (5, 231)	39.1					0.000
<b>Subject Expertise</b>						
		<b>B</b>	<b>SE</b>	<b><math>\beta</math></b>	<b><i>t</i></b>	<b><i>p</i></b>
(Constant)		2.3221	0.1976		11.751	0.000
Modeling and Guidance		0.319	0.0862	0.382	3.701	0.000
Supply and Support		0.2079	0.0738	0.266	2.818	0.005
Evaluation and Research		-0.3286	0.0949	-0.434	-3.462	0.000
Diffusion of Innovation		0.0869	0.1039	0.118	0.837	0.404
Communication and Inspiration		0.2177	0.0893	0.275	2.437	0.016
R Squared	0.376					
Adjusted R Squared	0.363		0.4344			
F (5, 231)	27.9					0.000
<b>Time Management</b>						
		<b>B</b>	<b>SE</b>	<b><math>\beta</math></b>	<b><i>t</i></b>	<b><i>p</i></b>
(Constant)		2.1792	0.2053		10.614	0.000
Modeling and Guidance		0.1819	0.0896	0.2035	2.031	0.043
Supply and Support		0.0219	0.0767	0.0262	0.286	0.775
Evaluation and Research		-0.2382	0.0986	-0.2939	-2.415	0.017
Diffusion of Innovation		0.4342	0.1079	0.5506	4.023	0.000
Communication and Inspiration		0.1402	0.0928	0.1653	1.511	0.132
R Squared	0.412					
Adjusted R Squared	0.399		0.4514			
F (5, 231)	32.4					0.000
<b>Students' Engagement</b>						
		<b>B</b>	<b>SE</b>	<b><math>\beta</math></b>	<b><i>t</i></b>	<b><i>p</i></b>
(Constant)		2.4918	0.1975		12.615	0.000
Modeling and Guidance		0.1684	0.0862	0.202	1.954	0.052
Supply and Support		0.1172	0.0738	0.15	1.590	0.113
Evaluation and Research		-0.3304	0.0949	-0.436	-3.483	0.001
Diffusion of Innovation		0.3429	0.1038	0.465	3.304	0.001
Communication and Inspiration		0.1845	0.0893	0.233	2.067	0.040
R Squared	0.377					
Adjusted R Squared	0.363		0.4343			
F (5, 231)	27.9					0.000

Table 19 shows the multiple regression analysis result that tells whether technology leadership techniques can be significant predictors of teaching effectiveness, singly or collectively. The result shows that 39.9% of the variance in technical proficiency can be accounted for by technology leadership techniques

collectively,  $F(5, 231)=32.4, p=0.000$ . The results show that modeling and guidance ( $\beta=0.292, t=2.92, p=0.004$ ) is the only factor that can positively lead to technical proficiency. The implication is that teachers will become more technically proficient if leaders show them how to properly incorporate and use technology in their lessons.

It can also be seen in the result that 32.9% of the variance in competence can be accounted for by the five predictors, collectively,  $F(5, 231)=24.1, p=0.000$ . Analyzing the individual contribution of the predictors, the result shows that modeling and guidance ( $\beta=0.213, t=2.015, p=0.045$ ), supply and support ( $\beta=0.278, t=2.865, p=0.005$ ) and communication and inspiration ( $\beta=0.244, t=2.111, p=0.036$ ) positively predict competence. This implies that when school administrators set a good example, guide teachers in integrating technology, provide adequate technology resources, support teachers in keeping up with the latest educational technology trends, and effectively communicate technology-related changes, it will have a positive impact on the teachers' competence level.

The analysis also shows that technology leadership techniques collectively explain 44.6% of the variance in compassion and empathy. This relationship is statistically significant, as indicated by  $F(5, 231)=39.1$  and  $p=0.000$ . The observed outcome is most likely attributed to the influence of communication and inspiration ( $\beta=0.3597, t=3.425, p=0.000$ ), which positively predict compassion and empathy. This implies that when leaders effectively encourage and motivate teachers to adopt technology, and create opportunities for open communication about technology-related matters and concerns, the teachers are more likely to develop positive and trusting relationships inside the classroom.

Based on the result, 36.3% of the variance in subject expertise can be collectively attributed to the five predictors,  $F(5, 231)=27.9, p=0.000$ . Individually, the table shows that three among the five predictors can positively predict subject expertise, namely, modeling and guidance ( $\beta=0.382, t=3.701, p=0.000$ ), supply and support ( $\beta=0.3266, t=2.818, p=0.005$ ), and communication and inspiration ( $\beta=0.275, t=2.437, p=0.016$ ). This suggests that teachers are likely to excel in their respective subjects and demonstrate expertise if school leaders effectively provide them with examples and guidance for integrating technology, support their technological needs and training, motivate them to embrace technological advancements, and promote effective communication.

It can also be seen in table 19 that 39.9% of the variance in time management can be accredited to technology leadership techniques, collectively,  $F(5, 231)=32.4, p=0.000$ . Looking at the individual contribution, it can be seen that modeling and guidance ( $\beta=0.2035, t=2.031, p=0.043$ ), and diffusion of innovation ( $\beta=0.5506, t=4.023, p=0.000$ ) positively predict time management. This suggests that when leaders demonstrate the correct use of technology, provide guidance throughout the technology integration process, and ensure the proper introduction of new technologies that align with the schools' educational goals and vision, teachers are directed to effectively manage and utilize their time, particularly for educational purposes.

Lastly, the result exhibits 36.3% of variance in students' engagement can be collectively attributed to the five predictors  $F(5, 231)=27.9, p=0.000$ . Individually, diffusion of innovation ( $\beta=0.465, t=3.304, p=0.001$ ) and communication and inspiration ( $\beta=0.233, t=2.067, p=0.040$ ) positively predict students' engagement. This means that when leaders stimulate the development of creative ideas, appropriately implement them, and generate a sense of passion and curiosity among teachers and students about emerging technology, teachers are more likely to encourage students to actively participate in the learning process.

**Table 20** Technology Leadership Competencies as Significant Predictors of the Teaching Effectiveness

Technical Proficiency		B	SE	$\beta$	$t$	$p$
(Constant)		1.6218	0.1997		8.121	0.000
Visionary Leadership and Management		-0.1101	0.0834	-0.129	-1.321	0.188
Digital Citizenship		0.3487	0.0782	0.379	4.460	0.000

Systematic Improvement		0.1881	0.0832	0.218	2.261	0.025
Instructional Expertise		-0.1550	0.0897	-0.188	-1.727	0.086
Problem Solving Ability		0.3739	0.0938	0.454	3.988	0.000
R Squared	0.486					
Adjusted R Squared	0.475		0.4213			
F (5, 231)	43.7					0.000
<b>Competence</b>						
		<b>B</b>	<b>SE</b>	<b><math>\beta</math></b>	<b><i>t</i></b>	<b><i>p</i></b>
(Constant)		1.9390	0.2065		9.391	0.000
Visionary Leadership and Management		-0.2138	0.0862	-0.2527	-2.480	0.014
Digital Citizenship		0.3092	0.0808	0.340	3.825	0.000
Systematic Improvement		0.2131	0.0860	0.2502	2.477	0.014
Instructional Expertise		-0.0415	0.0928	-0.0509	-0.447	0.655
Problem Solving Ability		0.3288	0.0969	0.4043	3.392	0.001
R Squared	0.437					
Adjusted R Squared	0.425		0.4355			
F (5, 231)	35.9					0.000
<b>Compassion and Empathy</b>						
		<b>B</b>	<b>SE</b>	<b><math>\beta</math></b>	<b><i>t</i></b>	<b><i>p</i></b>
(Constant)		1.8585	0.1852		10.033	0.000
Visionary Leadership and Management		-0.0384	0.0773	-0.0482	-0.497	0.620
Digital Citizenship		0.2743	0.0725	0.3203	3.783	0.000
Systematic Improvement		0.2773	0.0772	0.3457	3.592	0.000
Instructional Expertise		0.0669	0.0832	0.0871	0.804	0.422
Problem Solving Ability		0.0438	0.0870	0.0572	0.503	0.615
R Squared	0.489					
Adjusted R Squared	0.478		0.3907			
F (5, 231)	44.3					0.000
<b>Subject Expertise</b>						
		<b>B</b>	<b>SE</b>	<b><math>\beta</math></b>	<b><i>t</i></b>	<b><i>p</i></b>
(Constant)		2.1358	0.2010		10.625	0.000
Visionary Leadership and Management		0.0460	0.0839	0.0574	0.548	0.584
Digital Citizenship		0.3107	0.0787	0.3608	3.949	0.000
Systematic Improvement		0.0330	0.0838	0.0409	0.394	0.694
Instructional Expertise		-0.1279	0.0903	-0.1656	-1.416	0.158
Problem Solving Ability		0.2918	0.0944	0.3787	3.092	0.002
R Squared	0.406					
Adjusted R Squared	0.393		0.4240			

F (5, 231)	31.5					0.000
<b>Time Management</b>						
		<b>B</b>	<b>SE</b>	<b><math>\beta</math></b>	<b><i>t</i></b>	<b><i>p</i></b>
(Constant)		2.0785	0.2207		9.419	0.000
Visionary Leadership and Management		0.0000	0.0921	0.000	0.000	1.000
Digital Citizenship		0.1821	0.0864	0.1976	2.108	0.036
Systematic Improvement		0.0875	0.0920	0.1013	0.951	0.343
Instructional Expertise		0.0569	0.0992	0.0688	0.574	0.567
Problem Solving Ability		0.2421	0.1036	0.2936	2.337	0.020
R Squared	0.375					
Adjusted R Squared	0.361		0.4655			
F (5, 231)	27.7					0.000
<b>Students' Engagement</b>						
		<b>B</b>	<b>SE</b>	<b><math>\beta</math></b>	<b><i>t</i></b>	<b><i>p</i></b>
(Constant)		2.2772	0.2074		10.977	0.000
Visionary Leadership and Management		-0.0910	0.0866	-0.1136	-1.051	0.294
Digital Citizenship		0.2901	0.0812	0.3367	3.572	0.000
Systematic Improvement		0.1781	0.0865	0.2207	2.060	0.041
Instructional Expertise		-0.0119	0.0932	-0.0154	-0.128	0.898
Problem Solving Ability		0.1724	0.0974	0.2238	1.770	0.078
R Squared	0.367					
Adjusted R Squared	0.354		0.4376			
F (5, 231)	26.8					0.000

Table 20 shows the multiple regression analysis result that tells whether technology leadership competencies can be significant predictors of teaching effectiveness, singly or collectively. The result shows that 47.5% of the variance in technical proficiency can be accounted for by technology leadership competencies, collectively,  $F(5, 231)=43.7$ ,  $p=0.000$ . The results show that digital citizenship ( $\beta=0.379$ ,  $t=4.460$ ,  $p=0.000$ ), systematic improvement ( $\beta=0.218$ ,  $t=2.261$ ,  $p=0.025$ ) and problem-solving ability ( $\beta=0.454$ ,  $t=3.988$ ,  $p=0.000$ ) are the only factors that can positively predict technical proficiency. This suggests that if leaders possess the ability to facilitate professional development on technology, cultivate an environment that encourages ongoing enhancement in technology usage, and identify and assess challenges and issues associated with technology integration in the school, then teachers will experience an increase in their technological proficiency.

The result also shows that the five predictors account for 42.5% of the variance in competence, collectively,  $F(5, 231)=35.9$ ,  $p=0.000$ . The study found that digital citizenship ( $\beta=0.340$ ,  $t=3.825$ ,  $p=0.000$ ), systematic improvement ( $\beta=0.2502$ ,  $t=2.477$ ,  $p=0.014$ ), and problem-solving ability ( $\beta=0.4043$ ,  $t=3.392$ ,  $p=0.001$ ) all positively predict competence. This means that when school administrators incorporate educational technology tools and resources into administrative tasks, operations, and learning within the school, actively participate in strategic planning for technology integration, and have effective problem-solving abilities, it has a positive impact on teachers' competence levels.

The data also reveals that technical leadership competencies account for 47.8% of the variation in compassion and empathy, collectively. This association is statistically significant, with  $F(5, 231)=44.3$  and  $p=0.000$ . Digital citizenship ( $\beta=0.3203$ ,  $t=3.783$ ,  $p=0.000$ ) and systematic improvement ( $\beta=0.3457$ ,  $t=3.592$ ,



$p=0.000$ ) have a beneficial impact on compassion and empathy. This implies that when leaders stay informed about emerging educational technologies and their potential impact on education, and use data to assess the impact of technology initiatives on learning processes, teachers are better able to understand their students' individual needs and backgrounds.

According to the results, the five predictors collectively account for 39.3% of the variance in subject expertise  $F(5, 231)=31.5, p=0.000$ . Two of the five predictors, digital citizenship ( $\beta=0.3608, t=3.949, p=0.000$ ) and problem-solving ability ( $\beta=0.3787, t=3.092, p=0.002$ ), positively predict subject expertise. This implies that teachers are more likely to excel in their respective subjects and demonstrate expertise if school leaders incorporate educational technology tools and resources into school operations and work with teachers, parents, and other stakeholders to address technology-related challenges.

Table 20 shows that 36.1% of the variation in time management may be attributed to technological leadership competencies collectively. The statistical analysis indicates a significant relationship, with  $F(5, 231)=27.1, p=0.000$ . When examining the specific factors that contribute to time management, it is evident that digital citizenship ( $\beta=0.1976, t=2.108, p=0.036$ ) and problem-solving ability ( $\beta=0.2936, t=2.337, p=0.020$ ) positively predict time management. This implies that when leaders exhibit competence in utilizing commonly used digital tools and ensure that there are sufficient resources and expertise to handle technology-related issues within the school, teachers are guided to efficiently manage and make use of their time, specifically for educational purposes.

Finally, the result of the study demonstrates that 35.4% of the variation in students' engagement can be attributed to the five predictors collectively. This relationship is statistically significant, as indicated by  $F(5, 231)=26.8$  and  $p=0.000$ . Individually, the variables of digital citizenship ( $\beta=0.465, t=3.304, p=0.001$ ) and systematic improvement ( $\beta=0.233, t=2.067, p=0.040$ ) positive predictors of students' engagement. This implies that when leaders possess a comprehensive comprehension of the digital realm and motivate educators and staff to contemplate and improve their utilization of technology in the educational setting, teachers can establish a learning atmosphere that fosters active involvement and engagement from pupils.

#### 4. Conclusion and Recommendation

Based on the findings and result of the study, the following conclusion can be drawn.

Taking from the findings and analysis of the data, it can be concluded that the implementation of technology leadership techniques and competencies is crucial for establishing dynamic and influential educational settings that support teacher effectiveness and elevate student academic achievements. Technology leaders have the ability to effect positive transformations in education and enable educators to address the different needs of learners in the 21st century by cultivating a culture of collaboration and innovation, honing their leadership capabilities, and strategically working with technology.

Based from the result and findings presented, the following are recommended:

1. Implementing Leaders' Upscaling Program. Since technology is fast changing, it is recommended that leaders and teachers should have a regular upscaling program for continuous professional development. This is to enhance their technological skills, pedagogical knowledge, and digital literacy. This can be done by offering workshops, seminars, online courses, and coaching sessions that help educators in efficiently incorporating technology into their teaching methods and other educational activities.

2. Form Collaborative Community. Promote the establishment of cooperative learning communities among educators, administrators, and technology specialists. Promote the exchange of exemplary methods, concepts, and materials pertaining to the incorporation of technology. Establish collaborative platforms, such as virtual forums, professional learning networks, and joint projects, to enhance the exchange of knowledge and provide peer assistance.

3. Inclusion of Digital Citizenship Education in the curriculum. Promote the importance of digital citizenship education to encourage educators, students, and parents to engage in responsible and ethical utilization of technology. Offer tools, educational materials, and instruction on subjects such as internet safety, proper online behavior, safeguarding personal information, and the ability to evaluate and use information effectively.

#### **References:**

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