INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY: APPLIED BUSINESS AND EDUCATION RESEARCH
2024, Vol. 5, No. 4, 1250 – 1267
http://dx.doi.org/10.11594/ijmaber.05.04.13

Research Article

The Mediating Effects of Generational Affiliation to The Influence of Principals' Digital Leadership on Teachers' Technological Self-Efficacy

Lawrence Oliver V. Paunil*

Maryhill College, Inc. Lucena City, Philippines
Laguna State Polytechnic University, San Pablo City Campus, Philippines

Article history:
Submission April 2024
Revised April 2024
Accepted April 2024

**Corresponding author:*
E-mail:
lawrencepaunil@maryhillcollege.edu.ph

ABSTRACT

New technology developments are rapidly altering the teaching and learning environment. Schools require leaders who can assist the transformation process and promote a digital culture of learning. As a result, this study aims to determine the influence of the respondents' perceived digital leadership of principals on their technological self-efficacy when mediated by generational affiliation among private schools in Quezon province. Two instruments were used in this study: The principals' Digital Leadership questionnaire, which is based on the International Society for Technology Education (ISTE) standard for Education Leaders (2022) was administered to school principals/heads, while Teachers' Technological Self-Efficacy Questionnaire, which is based on the ISTE standard for Educators (2022) was administered to teachers. Descriptive and Inferential analysis was carried out using SPSS. The findings showed that the respondents significantly demonstrated generational work-related orientation, digital leadership, and technological self-efficacy. Furthermore, when respondents were categorized by generational affiliation, there were no significant differences in their work-related orientation, digital leadership, and technological self-efficacy. On the other hand, there was a significant influence of the principals' digital leadership on teachers' technological self-efficacy. Moreover, the respondents' generational affiliation/work-related orientation mediates the direct influence of Principals' Digital Leadership on the Teachers' Technological Self-efficacy. Principal preparation programs and teacher training programs may include technology-based leadership to improve technology integration in classrooms. It is advised that further studies be conducted on digital leadership and technical self-efficacy for administrators and teachers.

Keywords: *Generational affiliation/work-related orientation, ISTE, Principal's digital leadership, Teacher's technological self-efficacy*

How to cite:
Paunil, L. O. V. (2024). The Mediating Effects of Generational Affiliation to The Influence of Principals' Digital Leadership on Teachers' Technological Self-Efficacy. *International Journal of Multidisciplinary: Applied Business and Education Research*. *5*(4), 1250 – 1267. doi: 10.11594/ijmaber.05.04.13

Introduction

Schools worldwide, during the onset of the pandemic, were closed for an average of 79 teaching days in 2020, with the Philippines closed for more than a year, forcing students to enroll in distance learning modalities (Unicef Philippines, 2021). The Pandemic forced educational institutions to reorganize and embraced digital transformation that rapidly changed the schooling landscape. Institutions failing to take advantage of this will be slower, less flexible, and less competitive than other digital forerunner organizations (Holzmann et al., 2020). In this context, digitalization may alter the nature of work as well in different institutions – from physical classrooms to virtual classrooms and from physical workspaces in schools to digital workspaces at home (Wesseling et al., 2020). This kind of work transformation is regarded as a major challenge among leaders and top managers as they are involved in this process (Abbu & Gopalakrishna, 2021). Digital leaders are experts in strategic thinking and using advancements in each latest technology in generating revenue and add value to clients. Digital Leadership is critical for institutions to survive in this time of adaptation and reshaping of strategies in the emerging digital environment (Araujo et al., 2021).

The school leadership position is changing in the field of education along with the shifting standards for high-quality instruction. To be successful school leaders capable of driving schools to the transformative frontier, they must satisfy the standards of Education 4.0 and possess the necessary competencies, that is to be adaptable and change their leadership effectiveness to respond to the requirements of learners, partners, and education systems both locally and worldwide. (Kin & Kareem, 2019).

In order to enhance and change the landscape of education in the digital era, the International Society for Technology Education (ISTE) organization offers a set of standards that make up a framework. The ISTE Standards for Educators and Education Leaders act as a road map to help administrators and educators in enabling student learning. These benchmarks are intended to motivate administrators and teachers by developing methods that improve students' learning and broaden educators' teaching tools (International Society for Technology in Education, 2022).

It is vital for school administrators to be able to drive change in school supervision with the use of technology techniques. According to Australian research, developing digital competence has popped up as an integrated endeavor in the achievement of a fundamental change in the field of education. The use of innovation in K-12 education monitoring has the potential to increase educational supervisors' abilities to help in learning and teaching while also altering their understanding and performance of their jobs. Digital leadership also helps to link educational supervisory methods with the digital culture that currently pervades modern adolescent and childhood educational environments, allowing supervisors to use technology and associated leadership behaviors to drive true progress among educators and students (Aldawood et al., 2019). The research conducted at Bina Nusantara University in Jakarta, Indonesia, discovered that digital leadership has a direct and indirect effect on business model innovation. Client service orientation addressed indirect channels. This discovery has effects on the digital transformation concept, in which the digital leader played an important role in ensuring digitization based on their vision and aspirations, performance evaluation based on digital competence, and fundamental organization advancement based on digital operational effectiveness and digital culture (Mihardjo et al., 2019).

Furthermore, a qualitative study conducted at Undiknas Graduate School in Denpasar, Indonesia, using a phenomenological approach showed that in a traditional village, a leader with a digital leadership spirit in the traditional community must be more open to seeing improvements in worldview while preserving the foundation orientation that has been established or is used as a reference in the village. A leader with a digital leadership mindset may not be fluent in or totally comprehend the digital field, but they may generate work related to technology and drive highly skilled workers in the digital sector to achieve their goals. Digital leadership necessitates openness, collaboration, and the ability to abide by the rules, which

cannot be gained alone through digital abilities (Asri & Darma, 2020).

As educational institutions transition into digital-age learning environments, school administrators must adapt and urge their instructors to do the same. During the COVID-19 pandemic time in Turkey, Karakose, T., Polat, H., & Papadakis, S. (2021) did an in-depth and extensive investigation of teachers' opinions and experiences with digital leadership. According to the study's findings, school leaders' use of digital technology was adequate, as seen by instructors in their schools. In this environment, school principals chose to employ digital technology for communication, news and official announcements, document sharing, information, and online meetings. Similarly, during the COVID-19 epidemic in Kuwait, school principals demonstrated digital leadership qualities that influenced teachers' use of instructional technology. Furthermore, innovative school principals may optimize the use of digital resources and promote the integration of technology in schools (AlAjmi, 2022). As a consequence, digital leadership has had a detrimental effect on the educational process, school management, and school governance. In a nutshell, in order to help the educational system, leaders must develop their digital abilities (Damayanti & Mirfani, 2021).

In a study based on the Patterns of Digitization survey, which comprised responses from 559 decision-makers from five geographic zones — America, Europe, Asia, Africa, and Oceania — to examine how institutions are undergoing digital transformation. The findings verify that digitally mature institutions were likelier to have CEOs with strong technical expertise, make data-based decisions and evidence rather than intuition, and demonstrate an entrepreneurial spirit to workers. As a result, leaders' actions have a direct impact on employee performance and the implementation of digital transformation strategies (H. Abbu et al., 2020). Similarly, in a study conducted at the University of Patras in Patras, Greece, a leader who possesses the necessary digital skills and practices digital leadership is more likely to discover and capitalize on opportunities, resulting in his decisions contributing to the optimum growth and development of an institution in an Academic setting (Antonopoulou et al., 2021).

1. Problem Statement and Research Questions

Determining the mediating effects of generational affiliation / work-related orientation to the influence of principals' digital leadership on teachers' technological self-efficacy is essential in providing links among variables that will aid future researchers in their investigation in a different context.

The literature suggests that digital leaders with favorable generational work-related orientation are constructs that can be investigated if the respondents' technological self-efficacy can be examined. Therefore, the study will explore the following seven research questions:

(1). How are respondents described in terms of their Generational affiliation and Digital preference?

(2). What is the respondents' generational work-related orientation in terms of Work Attitudes Towards Authority; Achievement Orientation / Work Ethics; Work Value Orientation; and Digital Orientation?

(3). What is the Principals' level of digital leadership practices in terms of the ISTE standards for education leaders as Equity and Citizenship Advocates; Visionary Planners; Empowering Leaders; Systems Designers; and Connected Learners?

(4). What is the extent of the teachers' level of technological self-efficacy practices in terms of the ISTE standards for educators as Learners; Leaders; Citizens; Collaborators; Designers; facilitators; and Analysts?

(5). When grouped according to generational affiliation, is there a significant difference in the generational work-related orientation, the school principals' digital leadership, and the teachers' technological self-efficacy practices?

(6). Does the Principals' Digital Leadership significantly influence the Teachers' Technological self-efficacy?

(7). Do generational affiliation and work-related orientation mediate the relationship between the Principals' Digital Leadership and Teachers' Technological self-efficacy?

Methods

Research Design

The study was a quantitative study utilizing a correlational method, specifically explanatory (predictive) data analysis as the primary approach. It was a prediction given that it determined one or more factors (digital leadership, generational affiliation/work-related orientation) that can predict variations in another variable examined (technology self-efficacy).

Context and Participants

The population of the research includes 401 teachers and 20 school heads who were presently teaching/school managing in private schools in Lucena City, Sariaya, Tayabas, Pagbilao, Mauban, Lucban, Atimonan, and Catanauan Quezon Philippines.

The survey was completed by 23 private schools and the 3 schools with the most teacher respondents came from Maryhill College (82; 20.45%), Sacred Heart College (66; 16.46%), and College of Sciences, Technology and Communication Inc. (41; 10.22%).

Research Instrument

The study included two instruments: one for the teachers and another for the principals. Both instruments are organized into four sections for teachers and school administrators. The breakdown is as follows:

Part I. This part requires information on the respondent's demographic profile, such as school affiliation, age, digital preference, and birth year to assess generational affiliation.

Part II. This section determines the respondent's generational work-related orientation in the following domains: work attitudes towards authority, achievement orientation, work value orientation, and digital orientation. Indicators were driven from the literature to reaffirm each generation's work-related orientation (Temel Eginli & Isik, 2020; Cooney, 2021; Vogels, 2020; Dorsey, 2022; Gaidhani, S., Arora, L., & Sharma, B. K. 2019). The instrument consists of forty-four items to which respondents responded on a scale of 5 – Always, 4 – Often, 3 – Sometimes, 2 – Rarely, and 1 – Never.

Part III. This portion of the questionnaire evaluates the school principal's Digital Leadership in accordance with the International Society for Technology Education (ISTE) Standards for Educational Leaders (2019). The instrument has twenty-two items to which respondents replied on a scale of 1–Fully Demonstrated, 4–Significantly Demonstrated, 3–Somewhat Demonstrated, 2–Minimally Demonstrated, and 1–Not Demonstrated.

Part IV. This part assesses the teacher's technological self-efficacy, based on the International Society for Technology Education (ISTE) Standards for Educators (2019). The Questionnaire consists of twenty-four items to which respondents responded on a scale of 1–Fully Demonstrated, 4 – Significantly Demonstrated, 3 – Somewhat Demonstrated, 2 – Minimally Demonstrated, and 1–Not Demonstrated.

The respondent's responses to generational work-related orientation, digital leadership, and technological self-efficacy were averaged and interpreted verbally: 5.0-4.50 Fully Demonstrated, 4.49-3.50 Significantly Demonstrated, 3.49-2.50 – Somewhat Demonstrated, 2.49 –1.50 Minimally Demonstrated, and 1.49–1.0 Not Demonstrated

To assess the validity of their content, the instruments were checked and validated by three experts who were in the field of school management for more than 10 years. To examine their reliability, a pilot study was conducted in three private schools in Quezon Province involving 19 respondents. In addition, the reliability was measured using Cronbach's Alpha and the overall reliability test for Generational Work-Related Orientation, Principals' Digital Leadership, and Teachers' Technological Self-Efficacy was excellent (.996).

Results and Discussions

On Respondents' Digital Profile

On Generational Affiliation

When Table 1 is examined, it can be seen that among the school principal/head respondents, 11 (or 55%) were from Generation X, while 9 (or 45%) were from Generation Y. Meanwhile, among the teacher respondents 8 (2%) were Baby Boomers, 49 (12.22%) were from Generation X, 176 (43.89%) were from Generation Y, and 168 (41.90%) were from Generation Z. Indicating that there were more Generation X Principal and Generation Y Teacher respondents.

Table 1. Respondents' Current Status in Terms of Generational Affiliation

Generational Affiliation	Principals / School Heads		Teachers		Total
	f	%	f	%	
Baby Boomers	0	0	8	2.00	8
Generation X	11	55	49	12.22	50
Generation Y	9	45	176	43.89	185
Generation Z	0	0	168	41.90	168
Total	**20**	**100**	**401**	**100**	**421**

On Device Preference

Table 2. Respondents' Current Status in Terms of Device Preference

Generation	Smartphone		Tablet		Laptop		Desktop		No Device	
	f	%	f	%	f	%	f	%	f	%
Boomers	7	87.5	0	0.00	6	75	5	62.50	0	0
Gen X	51	85	7	11.67	44	73.33	28	46.67	0	0
Gen Y	177	95.68	40	21.62	158	85.41	71	38.38	0	0
Gen Z	166	98.81	31	18.45	144	85.71	38	22.62	0	0
Total	**401**	**95%**	**78**	**19%**	**352**	**84%**	**142**	**34%**	**0**	**0%**

Table 2 described the respondents' digital device preferences in which almost all (95%) respondents were smartphone users with Gen Z (98.81%) leading the way, followed by Gen Y (95.68%), Boomers (87.5%), and Gen X (85%). Similarly, the majority of the respondents (84%) own laptop computers, and Gen Z (85.71%) leads again, followed by Gen Y (85.41%), Boomers (75%), and Gen X (73.33%). However, only a minority own tablets (19%) and desktop computers (34%). Gen Y (21.62%), Gen Z (18.45%), and Gen X (11.67%) continue to utilize tablet computers, whereas Boomers (62.50%), Gen X (46.67%), Gen Y (38.38%), and Gen Z (22.62%) continue to use desktop computers.

On Preferred Internet Connectivity

Table 3. Respondents' Current Status in Terms of Internet Connectivity Preference

Generation	Broadband/DSL		Fiber Optic		Mobile Data		Pocket Wi-Fi		No Connectivity	
	f	%	f	%	f	%	f	%	f	%
Boomers	3	37.5	5	62.5	3	37.5	0	0.00	0	0
Gen X	24	40	24	40	22	36.67	4	6.67	0	0
Gen Y	85	45.95	73	39.46	97	52.43	10	5.41	1	1
Gen Z	57	33.93	74	44.05	104	61.90	10	5.95	1	1
Total	**169**	**40%**	**176**	**42%**	**226**	**54%**	**24**	**6%**	**2**	**0%**

When Table 3 is examined, it was gleaned that respondents prefer to use mobile data (54%), fiber optic (42%), Broadband/DSL (40%), and the least Pocket Wi-Fi (6%). In terms of generational affiliation, the Boomers prefer Fiber Optic (62.5%), mobile data (37.5%), and Broadband/DSL (37.5%) connectivity. While Gen Xers prefer Broadband/DSL (40%), Fiber Optic (40%), mobile data (36.67%), and pocket Wi-Fi (6.67%) internet connectivity. Whereas Gen Y chose mobile data (52.43%), Broadband/DSL (45.95%), Fiber Optic (39.46%), and pocket Wi-Fi (5.41%). Gen Z prefers mobile data (61.90%), Fiber Optic (44.05%), Broadband/DSL (33.93%), and pocket Wi-Fi (5.95%) connectivity.

On Preferred Social Media

Table 4. Respondents' Current Status in Terms of Social Media Preference

Generation	Broadband/DSL		Fiber Optic		Mobile Data		Pocket Wi-Fi		No Connectivity	
	f	%	f	%	f	%	f	%	f	%
Boomers	3	37.5	5	62.5	3	37.5	0	0.00	0	0
Gen X	24	40	24	40	22	36.67	4	6.67	0	0
Gen Y	85	45.95	73	39.46	97	52.43	10	5.41	1	1
Gen Z	57	33.93	74	44.05	104	61.90	10	5.95	1	1
Total	**169**	**40%**	**176**	**42%**	**226**	**54%**	**24**	**6%**	**2**	**0%**

The Social Media preference of the respondents shows their inkling to use different platforms (see Table 4). The use of Facebook/Messenger dominates across generations (99%) followed by YouTube (70%), Instagram (53%), TikTok (43%), and Twitter (22%). In terms of Generational affinity, Boomers (100%) and Gen X (100%) preferred using Facebook/Messenger followed by Gen Y (98.92%) and Gen Z (98.21%). YouTube was preferred by Gen Z (71.43%), Gen Y (70.27%), and Boomers (62.5%). Gen Z (72.02%) leads in the use of Instagram and it was followed by Gen Y (46.49%), Boomers (25%), and Gen X (21.67%). TikTok, on the other hand, was preferred by Gen Z (61.31%), Gen Y (38.92%), and Gen X (10%). Twitter was preferred by Gen Z (33.33%), Gen Y (19.46%), and Gen X (3.33%).

Perceived Generational Work-Related Orientation

Table 5. Summary of the Generational Work-Related Orientation

Scales	Mean	SD	Verbal Interpretation
Work Attitudes Toward Authority	4.6239	.85187	Fully Demonstrated
Achievement Orientation/Work Ethics	4.3282	.80348	Significantly Demonstrated
Work Value Orientation	4.2590	.79250	Significantly Demonstrated
Digital Orientation	4.3423	.82431	Significantly Demonstrated
Mean	**4.3884**	**.77435**	**Significantly Demonstrated**

The generational work-related orientation of the respondents was significantly demonstrated (M=4.39) as shown in Table 5. The working attitude toward the authority orientation of Teachers fully demonstrated (M=4.62) following a leader who possesses integrity, is respectful, and is a good listener, and. While their digital orientation (M=4.34) is seen in using the internet in getting relevant information and making use of digital devices to make tasks quick and easy. Their achievement orientation/work ethics (M=4.33) is visible in their ability to learn new things and explore technology in enhancing their tasks. The teachers' work value orientation (M=4.26) is manifested in their belief that equal opportunities are for all and rules and policies ought to be followed.

The findings imply that respondents had a favorable attitude toward their profession, particularly when interacting with authority in the workplace. Mostly in private schools, teachers were oriented to respect and put priority on professionalism. These values were usually found in the core values of the school that they have to impart to students by way of their examples, especially in their day-to-day dealings with their colleagues and superiors. In return school leaders were expected to lead with integrity and model the school's core values to the other member of the school community. At the end of each academic year, school leaders and teachers are evaluated on how much they were able to live the core values of the school.

School leaders and teachers with positive work attitudes can make the workplace more engaged and productive. The kind of respect that teachers give to their superiors was a good indicator that they are moving in the same direction. This is beneficial to school leaders since they can navigate their institution to what

they are envisioning it to be. Although, they need to earn the trust of the school community through his/her good work and passion to lead the school toward the fulfillment of its goals. Having a good listening heart as a school leader will also make a mark in the school community. This will lead to collaboration between school heads and teachers towards the same goal.

The results validate the literature of Gaidhani et. al. (2019) that employees of all generations value authority and exhibit it in various ways. Generation Xers are at peace with authorities and are not intimidated or terrified by titles, but Generation Y feels that respect must be earned. While gen z wants to work for an honest and trustworthy leader, they also expect their bosses to listen to their ideas and respect their feelings.

Digital Leadership Practice

Table 6. Summary of Principals' Digital Leadership

Scale	Mean	SD	Verbal Interpretation
Equity and Citizenship Advocate	4.1734	.80006	Significantly Demonstrated
Visionary Planner	4.2043	.82548	Significantly Demonstrated
Empowering Leader	4.2086	.81563	Significantly Demonstrated
Systems Designer	4.1787	.81246	Significantly Demonstrated
Connected Learner	4.1835	.80846	Significantly Demonstrated
Mean	**4.1897**	**.77622**	**Significantly Demonstrated**

Table 6 makes known the summary of school principals' digital leadership practices in relation to the ISTE standards for Education Leaders. Overall, the school principals' digital leadership practices were significantly demonstrated at the mean of 4.19. The empowering leader domain leads with a mean of 4.21 (significantly demonstrated). The teachers saw in their school leaders their encouragement to them to be professional, develop leadership skills, and pursue continuous updating especially the use of technology in education. Furthermore, the visionary planning (M=4.21) ability was observed through their digital leaders' way of expanding the common vision in creating a strategic plan with the aid of technology. The connected learner ability (M=4.18) was seen through the school leaders' participation in online professional learning and mentoring. As a systems designer (M=4.18) the teachers appreciated their leaders having the ability to protect the students' and teachers' privacy especially online. The equity and citizenship advocate (M=4.17) ability of the school leaders was observed through responsible online behavior that includes the proper use of technology.

The findings show that school leaders have a substantial role in creating a culture in which teachers and students are empowered to utilize technology in novel ways to enhance teaching and learning. School leaders prioritize the professional development of their teachers by sending them to different training and seminars that will enhance their skills and knowledge in different subject areas. Teachers were also sent to training and webinars about the use of new software and computer programs that will aid their teaching. School heads empower their teachers through professional development activities and give them chances to lead a team/committee/unit that will enhance their leadership skills.

Empowerment gives fresh chances for the academic community members to develop and expand beyond their existing capabilities, as well as learn new skills. It increases their motivation, offers fresh possibilities for them to enhance their leadership talents, and meets their own personal development demands. Teachers that are empowered have improved self-confidence, are eager to develop their own talents, and are looking for ways to use those skills to the advantage of the organization. Teachers get a sense of ownership as a result of empowerment, and they personalize the school's aims and objectives, associating their success with their own talents. Furthermore, the teacher's

performance increases when they connect rewards to their performance by making judgments about the problem and experiencing the results that follow.

The study's findings complement the research from Hamzah (2021), Gonzales and Jackson (2020), which states that principals must build, nurture, and sustain a dynamic, digital-age learning culture that delivers a comprehensive, relevant, and engaging education for all students. Moreover, school administrators and teachers must collaborate to develop innovative instructional practices that fit the current demands.

Technological Self-Efficacy Practices

Table 7. Summary of Teachers' Technological Self-Efficacy

Scale	Mean	SD	Verbal Interpretation
Learner	4.2082	.74299	Significantly Demonstrated
Leader	4.2383	.73531	Significantly Demonstrated
Citizen	4.2797	.75594	Significantly Demonstrated
Collaborator	4.2120	.76806	Significantly Demonstrated
Designer	4.2771	.75890	Significantly Demonstrated
Facilitator	4.2340	.75310	Significantly Demonstrated
Analyst	4.3230	.76404	Significantly Demonstrated
Mean	**4.2532**	**.71591**	**Significantly Demonstrated**

Table 7 indicates the summary of the teachers' technological self-efficacy practices in consonance with the ISTE standards for educators. The Summary table shows the technological self-efficacy practices of teachers were significantly demonstrated (M=4.25). The teachers feel confident in demonstrating all domains of the ISTE standard for educators. The teachers as analysts (M=4.32) were observed using technology in providing alternative ways for students to demonstrate competency and reflect on their learning. The designing ability (M=4.28) of teachers was demonstrated using technology to design, adapt, and personalize instruction that encourages independent learning and accommodates individual differences of students. The Teachers as digital citizens (M=4.28) enable learners to use digital devices properly. The Leadership ability (M=4.24) of teachers was demonstrated through advocating for balanced access to instructional technology, digital content, and learning opportunities to meet the diverse needs of students. The Facilitating ability (M=4.23) of teachers was observed through encouraging and modeling creativity in order to communicate ideas to students either face-to-face or virtual. Teachers as collaborators (M=4.21) spend time planning with colleagues and establishing authentic learning experiences with the help of technology. While teachers as learners (M=4.21) set professional learning objectives, implement methods, and evaluate their effectiveness with the aid of technology.

The data indicate that teachers were capable of interpreting and applying data to drive their lessons and assist students in meeting their learning objectives. Teachers in private schools use the learning management system software which provides students with learning resources that aid their learning. This system can be accessed online and gives students flexibility in learning even in their homes. There are different ways in which teachers and students can share their documents and collaborate to foster learning.

Technology may definitely increase individual student learning, but it can also foster collaboration among students, and teachers. Students may gain cooperation skills in the classroom and utilize other students as resource persons to learn by sharing their work and ideas through interactive sites, educational forums, and shared documents. Technology also makes it simpler for teachers to work together with their students (through communication such as email or online activities) and with other teachers. Technology may be an ideal tool for teachers to connect with other teachers, stay up to speed on the newest educational

resources, and figure out what works and what doesn't in the classroom. Giving these tools to teachers would benefit administrators, schools, and, of course, students, increasing student achievement and the educational system as a whole.

The findings support the literature from Vucaj (2020), which states that as education devices become more sophisticated, educators must find and use devices to help them distinguish how well they inform their students' knowledge acquisition and how conveniently it informs their judgment to modify their classroom practices as needed.

Analysis of Variance (ANOVA) on the Perceptions Among the Respondents When Grouped According to Birth Generation

Significant Difference of Respondents' Generational Work-Related Orientation When Grouped According to Birth Generation

Table 8. ANOVA on the Significant Difference of Generational Work-Related Orientation When Grouped According to Birth Generation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.020	3	1.340	2.255	.081
Within Groups	247.817	417	.594		
Total	**251.837**	**420**			

Table 8 shows the test of significant differences in the Generational Work-Related orientation of the school principals/heads and teachers when grouped according to generational affiliation. With a calculated F (3, 417) = 2.255 and p=.081 which is greater than .05 suggests that the null hypothesis will be sustained. Hence, it can be inferred that there is no significant difference in the respondents' generational work-related orientation when grouped according to birth generation. The result implies that the perceptions of the different generations in terms of work-related orientation were consistent. This may be the result of the sharing of practices and beliefs in the workplace as teachers experience multi-generational influences. In schools, teachers and principals interact with one another. They share their best practices and find solutions to problems, whether big or small. The constant interaction creates influences that change specific work-related behaviors among teachers and principals in different generational affiliations.

Having a diverse teaching force brings value to the school structure. Younger teachers are used to quickly evolving technology and the changes it precipitates. Similarly, more experienced teachers have knowledge gained from their years of experience that may drive decision-making. Consequently, increased productivity results from this fusion of new ideas with experience-based wisdom. This is one of the aims for a school to flourish and develop. Since a school would constantly drive teachers and administrators towards the same vision and mission, so regardless of generation, their work-related orientation was molded to the direction the school is taking. Every member of the school community should take part and make it a reality.

The study's findings validate White's (2023) claim that the unprecedented emergence of diverse generations in the workplace is generating unique chances for a diversity of ideas and experiences. Varied generations have different communication, cooperation, and decision-making approaches in which they share. This is critical for maintaining a strong organizational culture as well as diversity and inclusion.

Significant Difference of School Principals' Digital Leadership When Grouped According to Birth Generation

Table 9. ANOVA on the Significant Difference of Principals' Digital Leadership When Grouped According to Birth Generation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.545	3	.848	1.412	.239
Within Groups	250.515	417	.601		
Total	**253.060**	**420**			

Table 9 indicates the test of significant differences in the Digital Leadership practices of the school principals/heads when grouped according to birth generation. With a calculated F(3, 417) = 1.412 and p=.239 which is greater than .05 suggests that the null hypothesis will be sustained. Hence, it can be inferred that there is no significant difference in the school principals'/heads' digital leadership practices when grouped according to birth generation. The result implies that the level of digital leadership practices of school principals/heads is perceived to be consistent in different generational groups. This may be brought about by the effect of the covid-19 pandemic on the different schools that led to the upskilling and learning of school leaders from the process. The pandemic brought challenges to the school leaders, especially on ways schooling of students will continue amidst several restrictions that make them distant. School leaders turn to benchmarks and learn from other schools, especially the established ones, on ways they can solve the predicament. They also look into upskilling their current management skills and reskilling those outside their skillsets like digital skills. They attended several webinars and virtual training sessions that aid them to understand better the problem and how to solve them. The pandemic was only one of the challenges they faced but also Industry 4.0 and Education 4.0.

The forces of the Fourth Industrial Revolution, Education 4.0, and the pandemic were already pushing school administrators toward new methods of working, and their impact has been dramatic. This new era necessitates a new set of leadership abilities, ones we were already familiar with prior to the pandemic, and this change becomes both a challenge and an opportunity. It then resulted in the retooling of leadership capabilities, particularly in digital skills. Different generations of school leaders had to accept technology as one of the vehicles for education to prosper. Continuous upskilling and reskilling are the only way for school leaders to make a significant difference and prepare to lead their particular institutions.

The findings supported the literature from Tanucan et al (2022) that Filipino school leaders can direct their schools and stakeholders toward digital transformation to continue to stay adaptable and competent in a rapidly changing digital and social media landscape, implying that they continue to cope with and adapt to new work and educational changes despite an overabundance of challenges and transitions such as the pandemic.

Significant Difference in Teachers' Technological Self-Efficacy When Grouped According to Generational Affiliation

Table 10. ANOVA on the Significant Difference of Teachers' Technological Self-Efficacy When Grouped According to Generational Affiliation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.156	3	.385	.751	.522
Within Groups	214.105	417	.513		
Total	**215.262**	**420**			

Table 10 presents the test of significant differences in the technological self-efficacy of the teachers when grouped according to birth generation. With a calculated F (3, 417) = .751 and p=.522 which is greater than .05 suggests that the null hypothesis will be retained. Hence, it can be inferred that there is no significant difference in the teachers' technological self-efficacy practices when grouped according to birth generation. The result deduces that the level of teachers' technological self-efficacy among generational groups was consistent. It is possible that teachers of different generations adjusted their technological skills due to the challenges of the COVID-19 pandemic. The challenges that the school leaders have faced also cascaded to the teachers. Since there were a lot of changes that took place in the school system, they too need upskilling their current skillset and reskilling new ones. Digital skills were one of the foci during that time for it was through these aptitudes the schooling of students will continue. Teachers who knew how to use digital devices and software updated their skills in applying them. While those who are new to the utilization of such technology were reskilling until they were able to get used to it.

During the pandemic, the quick transition to distant learning immediately tested the teaching workforce's knowledge, perspectives, and abilities. Previously 'nice-to-have' digital integration skills became 'must-haves,' traditional classroom management and instructional design methods were improved to fit the new normal in teaching, and everyone was expected to embrace a high level of comfort with uncertainty as guidelines and expectations shifted on a weekly basis during the pandemic. The sudden adjustments to virtual and socially distant learning tested the teaching force's capabilities and conventional competencies. The teachers and school leaders, both had a unique chance and obligation to redefine their talents and create systems that would allow them to learn, unlearn, and relearn the information, attitudes, and skills required to thrive in the new normal.

This finding contradicts the research from Andreou et al (2022), who claim that experienced teachers may have reported lower self-efficacy because they had to re-assess their self-efficacy abilities in response to the new challenges given by the COVID-19 teaching adjustments. For beginning teachers, however, this abrupt switch may not have had the same influence on their self-efficacy evaluation since they had not yet integrated their daily teaching practices and experiences, and they are part of the "Internet generation" that actively uses technology in everyday life.

Influence of School Principals' Digital Leadership on Teachers' Technological Self-Efficacy

Table 11. Regression of Teachers' Technological Self-Efficacy Significantly Influenced by the Digital Leadership Practices of the School Principals

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Teachers' Technological Self-Efficacy (constant) Principals' Digital Leadership	.813	.661	.660	.41715

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
Teachers' Technological Self-Efficacy (constant) Principals' Digital Leadership	Regression	142.350	1	142.350	818.047	<.001
	Residual	72.911	419	.174		
	Total	215.262	420			

Coefficients

Model	Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
Teachers' Technological Self-Efficacy	1.111	.112		9.943	<.001
Principals' Digital Leadership	.750	.026	.813	28.602	<.001

Table 11 makes known the regression of teachers' technological self-efficacy significantly influenced by the digital leadership practices of the school principals. Multiple linear regression was used to test whether the school principals'/heads' digital leadership practices influence the Teachers' Technological self-efficacy taken.

The fitted regression model was: Teachers' Technological Self-efficacy=1.111 + 75.0 (principals' digital leadership practices).

The overall regression was statistically significant at R2=0.661, F(1, 419) = 818.047, p=<.000b.

It was found that the perceived principals' digital leadership style significantly influenced the teachers' technological self-efficacy (B = 75.0, p=<.000b). Hence, the null hypothesis was rejected.

The findings imply that the principals' digital leadership had a positive effect on teachers' technological self-efficacy at the different private schools in Quezon Province. Therefore, the principals' digital leadership style predicts the level of teachers' technological self-efficacy.

A Digital school leader motivates and influences its teachers and employees to achieve the institution's objectives. They must be receptive to new technologies and keep their skills and capacities up to date in terms of the institution's digitalization. As their interest in technology grows, they motivate and persuade their teachers to believe in their ability to use technology to improve the teaching and learning process. It is the principals' constant motivation to teachers that made them believe in their capacity to make use of digital devices and computer programs/applications in their day-to-day teaching. Principals may not be an expert in using digital technology but their awareness and openness in using it for education purposes were enough for teachers to be influenced.

As a result, Digital leadership is guiding the school toward digital transformation in order for it to stay competitive and flexible in the rapidly changing digital and social media ecosystem. A digital school leader's primary responsibility is to guide the institution through the process of adapting to digital transformation and integrating technology into the teaching and learning process as well as the institution's culture. Digital leaders may steer teachers, staff, and departments toward improved outcomes if they have a deep understanding of the institution's aims and aspirations, are informed of technological advances, and have a clear sense of their institution's capability for transformation.

This result affirmed the study of Dongan (2018) that there was a significant positive correlation between technological leadership and IT self-efficacy perceptions. When IT self-efficacy perception levels of school administrators rise, technological leadership levels rise as well. Similarly, the study's results validate the work of a Turkish study that says that digital leadership significantly impacts innovative work behavior. Employees who believe their leaders are digitally capable to maintain the exchange interaction are more confident and innovative in their work behavior in the organization (Erhan et al., 2022).

However, this was contrary to Raman et al.'s (2019) finding that there was no significant relationship between Principals' Technology Leadership and Teachers' Technology Integration. As a consequence, the technological leadership of the principals had no positive influence on teachers' technology integration in 21st-century classrooms at National Secondary Schools in Kedah's northern area. Also, a study conducted among Department of Education schools in Los Banos Laguna, Philippines, discovered that there were no significant

relationships between the school heads' technology leadership and teachers' ICT integration in the teaching-learning process (Quidasol, 2020).

Mediating Effects of Generational Work-Related Orientation Between the School Principals/Heads' Digital Leadership and Teachers' Technological Self-Efficacy

Table 12. Mediating Effect of Generational Affiliation to the Relationship of School Principals/Heads' Digital Leadership (X) and Teachers' Technological Self-Efficacy (Y)

TOTAL, DIRECT, AND INDIRECT OF X ON Y

Total Effect of X on Y

Effect	se	t	p	LLCI	ULCI
.750	.026	28.602	.000	.698	.802

Direct Effect of X on Y

Effect	se	t	p	LLCI	ULCI
.562	.030	18.738	.000	.503	.621

Indirect Effec t of X on Y

	Effect	BootSE	BootLLCI	BootULCI
GWRO	.188	.048	.106	.292

Level of confidence for all confidence in output: 95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals: 5000

The mediating effect of generational affiliation/work-related orientation is tested through multi-group analysis as seen in Table 30. This study divided the entire sample into different subgroups according to generation which are boomers, generation x, generation y, and generation z together with their work-related orientation

The result of the multi-group analysis found that the generational affiliation/work-related orientation of the respondents mediates the direct influence of Principals' Digital Leadership on the Teachers' Technological Self-efficacy (effect=.562, se=.030, t=18.738, p-value=<.000). Hence, the null hypothesis was rejected. This indicates that generational affiliation/work-related orientation significantly mediates the positive relationship between principals' digital leadership and teachers' technological self-efficacy. The respondents' significant demonstration of generational affiliation/work-related orientation led to an increase in the relationship between principals' digital leadership and teachers' technological self-efficacy. The results imply that the higher the level of generational work-related orientation the higher the influence of principals' digital leadership on the teachers' technological self-efficacy.

Digital School leaders with a good work attitude towards authority, achievement orientation, work value orientation, and digital orientation can be advantageous in influencing the teachers' belief in themselves to educate the young with the aid of digital technology through their digital leadership abilities. Digital leadership of school leaders and their knowledge of the implementation/integration of digital technology in the different facets of school management would be more beneficial if this would be coupled with the proper work attitude and behavior. Having the appropriate work orientation plus knowledge in the implementation of digital technology would greatly influence the teachers to use these technology-driven lessons and deliver them to students with ease and a high level of success. School leaders may rely on school officials or personnel to assist them in the implementation of technology-aided plans and their essential part is their motivation, direction, and good working relationship with the school community, especially the teachers. This will be a good impact on teachers as they lay the groundwork for learning in the classroom with the aid of technology.

It used to be the case that technology took a backseat. Now, with the pervasive application of digitalization, it has become the driving force for innovation and change. As a consequence, digital leaders are molding the executive level

of schools and influencing the teachers to believe in themselves to utilize technology as they involve themselves in the educative process. As digital school leaders become more adept at technology like the generations who are digital natives it harnesses its relationship to the teachers' technological self-efficacy. School leaders who are digital natives can be advantageous since they were formed and influenced by the senior generations in terms of their work-related orientations and have a profound knowledge of technology because they learned the skills as children. Schools and businesses are continuously using technology to improve their services and clients' experience. The prevalence of technology and the importance of the digital leader and technology-enabled teachers mean that schools have to continuously reinvent themselves.

The study's findings somehow reflect Mensah and Mi's (2019) results that age is a key demographic component that moderates the influence of computer self-efficacy on the desire to use e-government services. Also, whereas computer self-efficacy was a strong predictor of the desire to use, age had no direct influence on the intention to use. Similarly, the findings of this study are consistent with those of a study conducted at Prince of Songkla University in Thailand, which found significant differences between Digital Natives and Digital Immigrants in terms of confidence, ease of use, technological proficiency, and frequency of use in free time in the classroom. Digital Natives use technology more than Digital Immigrants and appear to be more adept and confident as a consequence. The result implies that digital immigrant educators believe that their pupils are the same as they have always been and that the same practices that worked for them as students would work for their students now (Howlett & Waemusa, 2018)

Discussion

Digital Technologies have profoundly changed the landscape of the manner school leaders manage and the educators' way of teaching. Digital devices, internet access, and social media platforms transformed from just personal entities now becoming a necessity in delivering instruction and other school services. Teachers invested heavily in gadgets to assist them in their day-to-day tasks at school. The Z generation and Millennial teachers are paving the way for this technological advancement in the educational setting.

Even in the midst of this digital progression in schools, the culture, values, traditions, and success orientation of teachers in educational institutions remain and are constantly practiced. It is noticeable that technology integration is blending quite well with the way teachers view the value of their work and achievement by utilizing digital devices to enhance their work orientations. This couldn't be made possible if not for their high regard for persons in authority. Their willingness to follow and learn the ropes of teaching with technology and embodying the school's vision, mission, and core values really helped. Also, teachers would not have that kind of respect if not for the school leaders' integrity, openness, and digital leadership as they provide and make use of technology in improving teaching and learning.

The influence of the school leaders emanates in their empowering spirit. Even school leaders who may lack the skills in terms of technology may look for talents within the school organization that can be tapped and assist them in understanding the predicament. While school leaders with digital skills can provide clearer direction and mentor teachers. The principals' empowering leadership ability can be observed in their way of encouraging their teachers to be professional, develop leadership skills, and pursue continuous updating especially the use of technology in education.

The kind of value given to teachers gave the boost that they need to believe in their capacity to use technology in teaching. As they were empowered by their leaders they gain the confidence they need to use technology in providing alternative ways for students to demonstrate competency and reflect on their learning. Truly an empowered teacher can empower his/her students to reach their full potential.

School principals' ability to lead by example and motivate their teachers to employ technology in their teaching lead to updating their skills on the current trends in the integration of technology in education through professional training and development. As a result, the

digital leadership style of school principals positively influenced the teachers' technological self-efficacy. When a school principal significantly performs digital leadership abilities the more his/her teachers would be motivated and believe in their capacity to integrate technology in their teaching. Furthermore, with a significant mediation of the work-related orientation, it can improve the relationship between the principals' digital leadership on teachers' technological self-efficacy.

Conclusions

From the findings of the study, the following conclusions were formulated:

Gen X and Millennial school principals/heads lead the generation mix of teachers where most of them were gen z and gen y while others were gen x and Boomers. They were all users of digital devices like smartphones, laptop computers, desktop computers, and tablet computers. Also, they were all subscribed to the internet through different connections like mobile data, fiber optic, broadband/DSL, and pocket Wi-Fi. They use these connections to access their social media accounts such as Facebook/messenger, YouTube, Instagram, TikTok, and Twitter.

The generational work-related orientation of the principals and teachers was significantly demonstrated. Their work attitudes towards authority, achievement orientation/work ethics, work value orientation, and digital orientation were also significantly demonstrated.

The digital leadership practices of the school principals/heads were significantly demonstrated. The ISTE standards for education leaders as equity and citizenship advocates, visionary planners, empowering leaders, system designers, and connected learners were exemplified by the principals/heads significantly.

The technological self-efficacy practices of the teachers were significantly demonstrated. The ISTE standards for educators as learners, leaders, citizens, collaborators, designers, facilitators, and analysts were epitomized by the teachers significantly.

When respondents were categorized by generational affiliation, there was no significant change in their work-related orientation, implying that the null hypothesis was sustained. Similarly, there was no significant difference in the digital leadership practices of school principals/heads, implying that the null hypothesis was retained. Furthermore, there was no significant change in the teacher's technological self-efficacy practices, implying that the null hypothesis was accepted.

The influence of the principals' digital leadership practices on teachers' technological self-efficacy was deemed significant signifying the rejection of the null hypothesis. Therefore, the principals' digital leadership style predicts the level of teachers' technological self-efficacy.

The generational affiliation of the respondents moderates the direct influence of Principals' Digital Leadership on the Teachers' Technological Self-efficacy indicating the rejection of the null hypothesis. As a result, generational affiliation/work-related orientation significantly mediates the positive relationship between principals' digital leadership and teachers' technological self-efficacy.

Recommendations

From the conclusions of the study, the following recommendations were made:

1. School principals/heads may provide professional development programs to assist teachers in using digital teaching approaches. This may provide teachers the confidence and incentive to continue using technology in the classroom, which will improve student learning effectiveness.
2. Principals' professional development may be organized so that they may not only be role models but also keep track of teachers' technology integration and upskill their current skillset and reskill new ones.
3. Principal preparatory programs and training, such as graduate school programs, may consider highlighting the application of 21st-century knowledge and pedagogical skills and styles of leadership such as Digital Leadership to increase and accelerate the integration of ICT for better instruction and learning in the classroom.
4. Teachers may consider being innovative in order to apply technology in the classrooms and make 21st-century learning and Education 4.0 a reality, as well as

continue to meet the needs of Z-generation students.

5. Teachers may participate in further training programs or enroll in graduate courses in order to proactively improve their skills in associated ICT competencies and subject knowledge in order to operate as an agent of technological advancement, as envisioned in Education 4.0.
6. Further study on digital leadership and technological self-efficacy in other provinces/regions of the Philippines is suggested to gather more definitive evidence. A study that involves the participation of the principals and teachers of DepEd schools would yield valuable information. A longitudinal research may also be conducted so that more thorough conclusions may be made.

Acknowledgment

This work would not have been possible without the support of Maryhill College. I am especially indebted to Rev. Fr. Allan Laqueo, President, Rev. Fr. Raul Macaraig, Vice President for Academics and Administration, and Sr. Rowena Labitigan, Vice President for Finance, who has been supportive of my career objectives and has taken steps to give me with protected academic time to achieve those goals.

I am grateful to everyone I have had the pleasure of working with on this dissertation paper. Each member of my Dissertation Committee has given me considerable personal and professional advice and has taught me a lot about scientific research and life in general. I would want to thank Dr. Elsa Callo, Dr. Eden Callo, Dr. Julie Fe Panoy, and Dr. Edilberto Andal in particular. They have taught me more than what I could possibly give them credit for as my professors and mentors. They have modeled for me what a good educator and person should be.

Nobody has been more essential to me in the pursuit of this undertaking than my family members. I'd want to thank my parents, siblings, and aunties for their love and guidance in anything I do. They are the ideal role models. Most significantly, I want to thank our God, the Father, who never fails to inspire us.

References

Abbu, H. R., & Gopalakrishna, P. (2021). Synergistic effects of market orientation implementation and internalization on firm performance: Direct marketing service provider industry. *Journal of Business Research*, *125*, 851–863. https://doi.org/10.1016/j.jbusres.2019.06.004

Abbu, H., Mugge, P., Gudergan, G., & Kwiatkowski, A. (2020). DIGITAL LEADERSHIP - Character and Competency Differentiates Digitally Mature Organizations. *2020 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC)*. https://doi.org/10.1109/ice/itmc49519.2020.9198576

AlAjmi, M. K. (2022). The impact of digital leadership on teachers' technology integration during the COVID-19 pandemic in Kuwait. *International Journal of Educational Research*, *112*, 101928. https://doi.org/10.1016/j.ijer.2022.101928

Aldawood, H., Alhejaili, A., Alabadi, M., Alharbi, O., & Skinner, G. (2019, July). Integrating Digital Leadership in an Educational Supervision Context: a Critical Appraisal. *2019 International Conference in Engineering Applications (ICEA)*. https://doi.org/10.1109/ceap.2019.8883484

Andreou, E., Roussi-Vergou, C., Tsermentseli, S., Menabò, L., & Guarini, A. (2022). Teachers' Self-Efficacy during the COVID-19 Pandemic in Greece: The Role of Risk Perception and Teachers' Relationship with Technology. *Education Sciences*, *12*(9), 600. https://doi.org/10.3390/educsci12090600

Antonopoulou, H., Halkiopoulos, C., Barlou, O., & Beligiannis, G. N. (2021). Associations between Traditional and Digital Leadership in Academic Environment: During the COVID-19 Pandemic. *Emerging Science Journal*, *5*(4), 405–428. https://doi.org/10.28991/esj-2021-01286

Araujo, L. M. D., Priadana, S., Paramarta, V., & Sunarsi, D. (2021). Digital leadership in

business organizations. *International Journal of Educational Administration, Management, and Leadership*, 5–16. https://doi.org/10.51629/ijeamal.v2i1.18

Asri, A. A. S. M. A. N., & Darma, G. S. (2020). Revealing the Digital Leadership Spurs in 4.0 Industrial Revolution. *International Journal of Business and Economics*, *3*(1), 93–100. https://doi.org/10.31295/ijbem.v3n1.135

Damayanti, F. P., & Mirfani, A. M. (2021). An Analysis of Digital Leadership in the Pandemic Covid-19 Era. *Proceedings of the 4th International Conference on Research of Educational Administration and Management (ICREAM 2020)*. https://doi.org/10.2991/assehr.k.210212.033

Doğan, Z. (2018, December 1). Examination of the Technology Leadership Self-Efficacy Perceptions of Educational Managers in Terms of the Self-Efficacy Perceptions of Information Technologies (Malatya Province Case). *Participatory Educational Research*, *5*(2), 51–66. https://doi.org/10.17275/per.18.9.5.2

Erhan, T., Uzunbacak, H. H., & Aydin, E. (2022, January 13). From conventional to digital leadership: exploring digitalization of leadership and innovative work behavior. *Management Research Review*. https://doi.org/10.1108/mrr-05-2021-0338

Gaidhani, S., Arora, L., & Sharma, B. K. (2019). Understanding the attitude of generation Z towards workplace. *International Journal of Management, Technology and Engineering, 9*(1), 2804-2812.

Gonzales, M. M., & Jackson, I. (2020). Going the Distance: What School Administrators Can Learn from One-to-One Laptop Schools. *Journal of School Administration Research and Development*, *5*, 55-60.

Hafiza Hamzah, N., Khalid M. Nasir, M., & Abdul Wahab, J. (2021). The Effects of Principals' Digital Leadership on Teachers' Digital Teaching during the Covid-19 Pandemic in Malaysia. *Journal of Education and E-Learning Research*, *8*(2), 216–221. https://doi.org/10.20448/journal.509.2021.82.216.221

Holzmann, P., Breitenecker, R. J., Schwarz, E. J., & Gregori, P. (2020). Business model design for novel technologies in nascent industries: An investigation of 3D printing service providers. *Technological Forecasting and Social Change*, *159*, 120193. https://doi.org/10.1016/j.techfore.2020.120193

Howlett, G., & Waemusa, Z. (2018). Digital Native/Digital Immigrant Divide: EFL Teachers' Mobile Device Experiences and Practice. *Contemporary Educational Technology*, *9*(4), 374–389. https://doi.org/10.30935/cet.471007

International Society for Technology in Education. (2022a). *ISTE Standards: Education Leaders*. ISTE. Retrieved September 12, 2022, from https://www.iste.org/standards/iste-standards-for-education-leaders

International Society for Technology in Education. (2022b). *ISTE Standards: Educators*. ISTE. Retrieved September 12, 2022, from https://www.iste.org/standards/iste-standards-for-teachers

Karakose, T., Polat, H., & Papadakis, S. (2021, December 5). Examining Teachers' Perspectives on School Principals' Digital Leadership Roles and Technology Capabilities during the COVID-19 Pandemic. *Sustainability*, *13*(23), 13448. https://doi.org/10.3390/su132313448

Kin, T. M., & Kareem, O. A. (2019, May 25). School leaders' Competencies that make a difference in the Era of Education 4.0: A Conceptual Framework. *International Journal of Academic Research in Business and Social Sciences*, *9*(4). https://doi.org/10.6007/ijarbss/v9-i4/5836

Mensah, I. K., & Mi, J. (2019). Computer self-efficacy and e-government service adoption: the moderating role of age as a demographic factor. *International Journal of Public Administration*, *42*(2), 158-167.

Mihardjo, L. W., Sasmoko, S., Alamsjah, F., & Elidjen, E. (2019). Digital leadership role in developing business model innovation and customer experience orientation in

industry 4.0. *Management Science Letters*, 1749–1762. https://doi.org/10.5267/j.msl.2019.6.015

Quidasol, G. D. (2020, July 31). School Heads Technology Leadership and Its Relationship with Teachers and Learners Performance. *International Journal of Advanced Research*, *8*(07), 12–22. https://doi.org/10.21474/ijar01/11258

Tanucan, J. C. M., Negrido, C. V., & Malaga, G. N. (2022). Digital Leadership of School Heads and Job Satisfaction of Teachers in the Philippines during the Pandemic. *International Journal of Learning, Teaching and Educational Research*, *21*(10), 1–18. https://doi.org/10.26803/ijlter.21.10.1

Temel Eginli, A., & Isik, S. (2020, February). Generational Differences in Digital Age a Research on Technology Experiences of Generations. *International Journal of Scientific and Technology Research, 9*(2). http://www.ijstr.org/final-print/feb2020/Generational-Differences-n-Digital-Age-A-Research-On-Technology-Experiences-Of-Generations.pdf

Unicef Philippines. (2021, August 25). *Filipino children continue missing education opportunities in another year of school closure*. unicef.org. https://www.unicef.org/philippines/press-releases/filipino-children-continue-missing-education-opportunities-another-year-school

Vucaj, I. (2020). Development and initial validation of Digital Age Teaching Scale (DATS) to assess the application of ISTE Standards for Educators in K–12 education classrooms. *Journal of Research on Technology in Education*, *54*(2), 226–248. https://doi.org/10.1080/15391523.2020.1840461

Wesseling, J. H., Bidmon, C., & Bohnsack, R. (2020). Business model design spaces in socio-technical transitions: The case of electric driving in the Netherlands. *Technological Forecasting and Social Change*, *154*, 119950. https://doi.org/10.1016/j.techfore.2020.119950

White, T. (2023). *5 Generations in the Workplace: How to Engage Them All. Roundstone Insurance*. https://roundstoneinsurance.com/blog/generations-in-the-workpla