

The Impact of School Heads' Technology Leadership on Teachers' Technological Proficiency and Academic Optimism

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Abstract

The adoption, integration, and use of technology in the classroom should be planned by school leaders and teachers, who should also arm themselves with the newest technological developments. This study was designed to determine the impact of school heads' technology leadership to teachers' instructional innovation and academic optimism during the COVID-19 period. The study utilized a quantitative research design and a descriptive-correlational research method and was confined among 31 school heads and 651 teachers in Candelaria East and West Districts during the S.Y. 2021-2022. The survey-questionnaire, which was developed by the researcher and validated by research practitioners and experts, was the primary data gathering tool. From the findings, it was deduced that there is no significant difference between the perception of the elementary and secondary teachers on the school head's technology leadership, teachers' technological proficiency, and teachers' academic optimism. It revealed that the social, legal, and ethical issues; and the leadership and vision significantly predict the teachers' technological proficiency while the social, legal, and ethical issues; leadership and vision; productivity and professional practice and support; and management, operations, and finance significantly predict the teachers' academic optimism. In light of the findings and conclusion, the study recommends that DepEd may include the nature and concept of digital citizenship in school management and leadership.

Keywords: *technology leadership, technological proficiency, technology integration, academic optimism, ICT*

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1. Introduction

The school is on the verge of facing the challenge of how to fully infuse and embrace technological advancement. Principals and teachers must plan how they will adopt, infuse, and use technology in the classroom, as well as equip themselves with the most recent technological trends especially in this time of pandemic. A principal's role is to encourage his teachers to adopt and incorporate technology into the learning process. Teachers, as the frontliners of the education sector, should embrace the use of technology in the classroom openly. They must demonstrate proficiency in incorporating technology into classroom instruction and viewing it as pedagogical innovation.

At the moment, education systems around the world are embracing and instilling the tenets and ideals of the Fourth Industrial Revolution, which has primarily prompted the call for the advancement of the digital economy, robotics, and scientific advancement, and automation technology (Kin & Kareem, 2019). The role of digital media in education was also expanding, resulting in an increase in discussions about the consequences of this shift to the digital. With the global crisis caused by the Covid-19 pandemic, these discussions became more heated, and the importance of fully integrating digital technologies and education became clearer. According to the 2020 World Economic Forum, this public health crisis exposed the inadequacies in digital education, particularly in teaching-learning contexts, as a result of the social distance imposed by the crisis. In this way, the use of ICTs in education aims to enhance, supplement, and revolutionize the learning environment.

Given the fact that Department of Education (DepEd) gives programs to provide the public schools with appropriate technologies for the teaching-learning process, the personnel still need upskilling and familiarity to the recent trends in educational technology especially nowadays that the world is facing the challenges of the distance learning brought by the pandemic. According to Quidasol (2020), some DepEd School Division Offices are already regulating the distribution of DCP packages to schools. Despite the government's achievement in providing ICT infrastructure for the integration of technology in classrooms, there are still a number of problems that limit its full implementation and contribute to under-utilization of these facilities. In the use of ICT in education, teachers' readiness and skills in using ICT are critical (Hennessy et al., 2010). Some teachers are afraid to employ technology because they are concerned that their students may outperform them. Teachers must have appropriate ICT abilities and a high level of confidence in

order to implement technology in the classroom. These are some of the reasons why teachers may be hesitant to use ICT in their classrooms. Despite the adoption of the Enhanced Basic Education Act of 2013, the quality of basic education remains inadequate, according to a report (Business World, 2019). National Achievement Test results are still low, and they are concerned that this will have an impact on their life in the future.

The use of technology in the classroom is heavily influenced by the school's leadership. Principals of public schools have the power to advance the use of technology in education. According to studies, effective technology leadership is critical in today's education. School leaders with technological capabilities are more successful in implementing technology in the classroom (Schrum et al., 2011). Improving technology leadership could lead to better technology spending decisions and more effective classroom use of technology.

In this regard, it is important in our school community to conduct a more thorough investigation and planning of school head technology training programs, which are necessary to establish adequate systems and approaches that ensure the use of these technologies as actual support tools, primarily for teachers and students. In light of the foregoing arguments, this study investigates the impact of school leaders' technology leadership on teachers' technological proficiency and academic optimism during the COVID-19 period.

2. Literature Review

2.1. School Heads' Technology Leadership

A technology leader must understand how to use technology to improve teaching, develop strategies to assist teachers in incorporating technology into teaching, and form a technology team and support system to continuously promote an organization's use of new technology. The important tasks of a school principal include planning and implementing innovative technology strategies, assisting teachers in perceiving and understanding the importance of teaching and technology, and integrating technology into curriculum and teaching to improve teaching effectiveness. A school principal should be knowledgeable about information technology, have the ability to integrate resources, and be able to envision a well-planned future technological scene (Hsieh & Hsiao, 2013). Furthermore, a school principal must use leadership skills to encourage school teachers and non-teaching staff to pursue training in order to improve their information technology skills, develop skills in applying technology in administration and teaching, create a

communal and supportive school environment, and improve school administration, teaching, and students' learning and performance.

School technology leadership must be actively impressed upon pre-service school leaders in order for effective implementation and change to occur. “Without basic technology competency, it stands to reason that most school leaders lack the ability to understand the various policy and planning issues related to the successful implementation of technology” (Rivard, 2010). Furthermore, administrators need more opportunities to obtain knowledge regarding these challenges and how they can be effective digital change agents (Holland & Moore-Steward, 2000). The knowledge and understanding of school technology leadership can either be infused in a preparatory program, or a current administrator can obtain the needed information and skills while on the job through professional development.

Educational leadership must do a better job of preparing future leaders. School technology leadership was described traditionally in three domains. The first domain includes researching how digital technologies are used to teach traditional educational leadership content. The second domain is focused on training school administrators on how to better use digital technologies. The third domain focuses on how to prepare school administrators to be better technology leaders. Little research or preparation yet exists regarding the third domain, which is the most important and impactful of the three (McLeod et al., 2011).

According to Apsorn et al. (2019), the majority of educational technology problems in Thailand are driven by administrators' unwillingness to use information technology. Administrators are still unprepared to master new technologies and do not understand the value of innovation and information technology. Administrators lack the knowledge, experience, and ability needed to establish creative media and information technologies, as well as other teaching and learning aspects, through the use of media. Furthermore, the majority of Thai school administrators still lack ICT leadership skills, which is a serious issue affecting educational administration and management at both the school and national levels.

To develop a technology-rich school environment, school administrators must collaborate to leverage the resources needed to maintain a commitment to the integration of digital innovation into their schools. Technology leadership is critical to the success of technology initiatives. They

also found that technology leadership has a bigger impact on intended results than technology infrastructure and spending (Anderson & Dexter, 2005).

Effective technology leadership may assist kids in learning more efficiently and drive technology renovation projects in schools. While teacher technology literacy has a direct impact on teaching effectiveness, principal technology leadership may help teachers increase their technology literacy and encourage them to use technology in their classrooms (Chang, 2012). According to Hsieh and Hsiao (2013), the principal technology leadership is divided into five sub-dimensions after studying and systematizing relevant research: "vision, plan, and management," "member development and training," "support of technology and basic infrastructure," "assessment and research," and "interpersonal relationship and communication skill".

2.2. Teachers' Technological Proficiency

In the same context, not only the principal should possess the capability and competence of technological infusion in the school but also the teachers. Teachers as the frontliners of the education sector should openly embrace the use of technology in teaching. Basitere and Ndetolvala (2017) showed that the use of technology may bring deep and meaningful collaborative learning. The result quietly contributed an excellent performance and a well-versed proficiency in technology. Moreover, the study of Hero (2019) revealed that teachers show proficiency in how they infuse technology in teaching inside the classroom and considering it as pedagogical innovation in the education paradigm.

It is possible to become proficient at using technical tools and equipment with practice and education. It is essential to keep technical tools and equipment accessible while introducing experimentation into instructional methods. Knowledge of technology appears to be important for many facets of the teaching profession, including lesson planning and the education of students. The beliefs of teachers about how a subject should be taught and the abilities associated with teacher competence in managing classroom activities using technology tools and devices are additional factors that influence teachers' decisions to integrate technology into teaching and learning activities. Therefore, in order to produce the desired results, teachers must be able to use the technological knowledge and abilities needed in professional work duties and responsibilities (Saad & Sankaran, 2020).

Proficiency in using technological tools and devices can be achieved through experience and instruction. It is necessary to introduce experimentation into teaching practices and maintain accessible technological tools and devices. Technology proficiency seems relevant to many aspects of the teaching profession, such as lesson preparation and development of teaching kids. Other aspects that impact teacher decisions to introduce technology into teaching and learning activities are teachers' beliefs about the way the subject should be taught and the skills associated with teacher competence in managing classroom activities using technology tools and devices. Therefore, teachers must be able to apply the technological knowledge and skills required in professional job roles and responsibilities in order to achieve the expected outputs (Saad & Sankaran, 2020).

One of the major challenges in school education in a developing country is to bring better quality and standardization. ICT can be a very valuable tool to tackle this problem. ICT not only helps in the teaching and learning process, it also helps in assessment and evaluation, as well as in promoting inclusive education (Tikam, 2013). ICT can provide better access to educational resources, improve the quality of learning, improve teachers' productivity and can act as an effective tool to bridge the digital divide between various socio-economic strata. It also enhances students' participation which improves their success rate (Naji, 2017). Success or failure of ICT implementation depends on how teachers perceive themselves to be proficient in using ICT in the classroom. Teachers' perception related to their proficiency is influenced both by non-manipulative teachers' factors (demographic characteristics of the teachers) and manipulative teachers' factors (such as language of delivery, school board, and training facilities. Apau (2017) found in a study that teachers had a lack of technological content knowledge. He recommends that teachers and lecturers should continue to model the use of technology in teaching to update them on the technological pedagogical content further.

2.3. Teachers' Academic Optimism

Optimism, in general, envisions positive outcomes. Optimistic people are bound to show strength when confronting challenging circumstances despite the fact that they may show moderate advancement. They are stronger when confronting difficulties compared to less enthusiastic and confident people (Gómez-Molinero et al., 2018).

As to the relationship of the school heads' leadership and teachers' academic optimism, Dean (2011), found a strong and positive relationship to the pattern of leadership distribution and

the amount of planful alignment. These patterns signify the degree to which the acts of leadership are consciously aligned across the sources of leadership and the degree to which the method is either planned or spontaneous. The more academically optimistic teachers are, the more likely they are to describe the leadership as distributed in their schools in a prearranged pattern that focuses on the goals of the school.

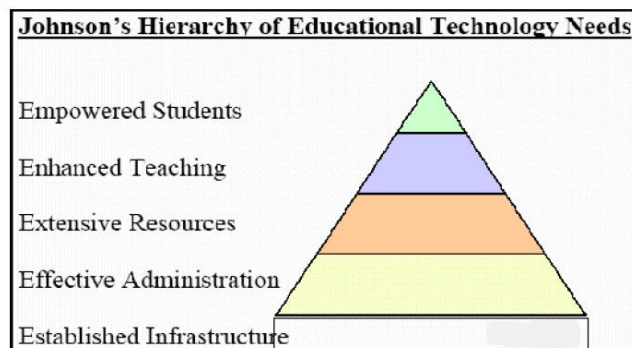
Evidence has confirmed that academic optimism is a predictor of a positive school climate that may probably turn into reinforcing collaboration within the borders of school. When a collaborative climate is established among faculty, students, and parents, they will feel free of stress and become more creative. Because they are sure of that, they can develop a prolific learning environment, and students and parents will not become barriers in accomplishing their goals (Dean, 2011). For these reasons given, when a high sense of academic optimism exists, teachers are expected to be in collaboration with one another and share their skills and knowledge to have a better school in terms of academic achievement. They trust their own capability and students to reach determined expectations.

2.4. Theoretical Framework

The Johnson's Hierarchy of Educational Technology Needs by Johnson (2003) and Roger's Diffusion of Innovation Theory by E.M. Rogers (1962) are some of the theoretical bases of this study. Johnson (2003) observes that in the world of technology, certain basic needs must be met before total technology integration can occur. Johnson's Hierarchy of Educational Technology Needs (figure 1) begins with the most basic technological need of an established infrastructure and progresses to the ultimate goal of any technology-rich school community: empowered students. The theoretical framework for this study is illustrated in Figure 1.

Figure 1

Johnson's Hierarchy of Educational Technology Needs



This study relies on this theory to suggest that principals should take the reins as the school's administrative and technological educational leader. Administrators who comprehend the dissemination of innovations and the concerns of the stakeholders involved are more likely to establish the culture of systemic change that is necessary for the successful integration of technology.

According to the diffusion of innovation theory, instrumentality and interpersonal contacts provide information and influence the opinions and judgments of an organization's members regarding specific technologies. As a result, the nature of networks within an organization or community, as well as the roles that opinion leaders play in them, influence the likelihood that an innovation will be adopted (Pope et al., 2002). Roger's theory should be familiar to school administrators to understand where their staff stands as well as their ability levels. Technology leadership is inextricably linked to innovation; therefore, administrators must understand the procedures, policies, and situations involved (Kearsley & Lynch, 1992).

3. Methodology

3.1. Research Design and Procedure

The researcher utilized a quantitative research design and a descriptive-correlational research method. As the study explored certain topics on school heads' technology leadership, different literatures were considered in the formulation of the main focus and the hypothesis to be delivered. The framework was based from the concepts examined by other experts and subjected to what is the current practice in public schools today in response to the technology advancement.

The study secured approval from the division superintendent, district supervisor, principals and school head for the conduct the study in their respective schools. The questionnaires and letter to the respondents were created and disseminated via Google forms through Facebook messenger due to the pandemic. The instruments were retrieved thereafter.

3.2. Population and Sampling

This study was carried out among public school heads and teachers in Candelaria East and West District in Candelaria, Quezon. This study used stratified random sampling from the 937 total population of teachers and school heads in Candelaria East and West Districts grouped into Elementary and Secondary as needed for this study. A total of 461 or 77.61% of teachers and

school heads from Elementary and 221 or 64.43% of teachers and school heads from Secondary were the actual samples in this study. Generally, a total of 682 or 72.79% of the total population were the actual respondents in this study.

3.3. Research Instrument

The researcher-made survey questionnaire was the primary source of information. The first part dwells on technology leadership of the school principal formulated through the six constructs from 2001 Technology Standards for School Administrators (TSSA, 2001). This part consists of 6 statements per domains and used 5-point Likert scale. The second part adapted the ideas from the Educational Technology Standards Scale (ETSS) that was drawn from the standards-based design of the International Society for Technology in Education (ISTE, NETS-T) to measure the teachers' technological proficiency. It also has 6 statements per domains and used 5-point Likert scale. Meanwhile, the level of Academic Optimism of the respondents were aligned with the 3 areas of AO.

Subject experts provided corrections and suggestions to ensure content accuracy. Meanwhile, one district supervisor, one school head, and two master teachers checked the contents validity of the questionnaire. In addition, the study conducted a pilot test to 20 teachers before the actual conduct of the study to measure the internal consistency of the instrument. As shown in table 1, all items were on the excellent level on the test of reliability.

Table 1
Level of Internal Consistency of the Validated Research Instrument

| Subscale | No. of Items | Cronbach's Alpha |
|---|--------------|------------------|
| School Heads' Technology Leadership | | |
| Leadership and Vision | 6 | 0.944 |
| Teaching and Learning | 6 | 0.965 |
| Productivity and Professional Practice | 6 | 0.979 |
| Support, Management, Operations and Finance | 6 | 0.980 |
| Assessment and Evaluation | 6 | 0.984 |
| Social, Legal and Ethical Issues | 6 | 0.983 |
| Teachers' Technological Proficiency | | |
| Technology Operations and Concept | 6 | 0.971 |
| Planning and Designing Environments and Experiences | 6 | 0.980 |
| Teaching, Learning and Curriculum | 6 | 0.992 |
| Assessment and Evaluation | 6 | 0.986 |
| Productivity and Professional Practice | 6 | 0.981 |
| Social, Ethical, Legal and Human Issues | 6 | 0.985 |
| Academic Optimism | | |
| Collective Trust | 6 | 0.963 |
| Self-Efficacy | 6 | 0.982 |
| Academic Emphasis | 6 | 0.990 |

Legend: 0.90 and above Excellent, 0.80-0.89 Good, 0.70-0.79 Acceptable, 0.60-0.69 Questionable, 0.50-0.59 Poor, Below 0.50 Unacceptable

3.4. Statistical Analysis

Data were analyzed and interpreted using mean and standard deviation. The perception of the 2 different groups: the elementary and secondary teachers, was differentiated using the Independent T-test while Multiple Linear Regression Analysis used to determine the relationship of the variables.

Honesty in reporting is one of the ethical standards in the conduct of the study. The study also ensured the confidentiality of the respondent's information.

4. Results and Discussion

The 1 presents the summary of the 31 school heads' technology leadership expertise and their extent of performance using technology in school management.

Table 2

Summary Table on the Level of School Heads' Technology Leadership

| Domains | Mean | Std. Deviation | Descriptive Interpretation |
|--|-------------|----------------|----------------------------|
| 1. Leadership and Vision | 4.02 | 0.78 | Highly Demonstrated |
| 2. Teaching and Learning | 3.94 | 0.82 | Highly Demonstrated |
| 3. Productivity and Professional Practice | 4.06 | 0.79 | Highly Demonstrated |
| 4. Support, Management, Operations and Finance | 3.92 | 0.82 | Highly Demonstrated |
| 5. Assessment and Evaluation | 3.96 | 0.80 | Highly Demonstrated |
| 6. Social, Legal and Ethical Issues | 4.04 | 0.81 | Highly Demonstrated |
| OVERALL | 3.99 | 0.80 | Highly Demonstrated |

Legend: 4.50-5.00 – Always/Very Highly Demonstrated; 3.50-4.49 – Often/Highly Demonstrated; 2.50-3.49 – Sometimes/Moderately Demonstrated; 1.50-2.49 – Rarely/Slightly Demonstrated; 1.00-1.49 – Never/Not Demonstrated

The (6) domains or standards of the school heads' technology leadership were all regularly done and observed as it got an overall verbal interpretation of “*highly demonstrated*” and garnered a total mean score of 3.99. Productivity and professional practice got the highest mean score of

4.06 while support, management, operations and finance got the lowest mean of 3.92 which both indicates that the school heads “highly demonstrated” this aspect of technology leadership.

The results show that the school principals in Candelaria take part in professional development events that aims to expand and improve their technological capabilities. They also develop and participate in learning communities that encourage, nurture, and assist teachers and staff in their use of technology to increase productivity. The school head maintains awareness of emerging technologies and their potential uses in education keeps abreast of new technology and their possible applications in education. It also shows that school principal frequently seeks additional financial support to help fulfill the school's technology demands such as internet/load allowance and the like. The faculty and staff are assisted in connecting to and utilizing school-level technological platforms for management and operations. On productivity and professional practice, the school heads performed and demonstrated each indicator regularly. A large number of school principals took part in professional development events aimed at enhancing or expanding their use of technology. The results show that all the competencies that a technology leader should have been significantly practiced by the school heads in Candelaria East and West Districts.

The results contrast with the study of Sincar (2013) and Voogt et al. (2013) on the lack of resources, resistance to innovation, lack of in- service training, and bureaucracy.

Table 2

Summary Table on the Level of Teachers' Technological Proficiency

| Domains | Mean | Std. Deviation | Verbal Interpretation |
|---|-------------|----------------|--------------------------|
| 1. Technology Operations and Concept | 3.98 | 0.69 | Highly Proficient |
| 2. Planning and Designing Learning Environments and Experiences | 4.05 | 0.68 | Highly Proficient |
| 3. Teaching, Learning and the Curriculum | 4.00 | 0.70 | Highly Proficient |
| 4. Assessment and Evaluation | 3.95 | 0.68 | Highly Proficient |
| 5. Productivity and Professional Practice | 4.10 | 0.67 | Highly Proficient |
| 6. Social, Ethical, Legal and Human Issues | 3.98 | 0.70 | Highly Proficient |
| OVERALL | 4.01 | 0.69 | Highly Proficient |

Legend: 4.50-5.00 – Very Highly Proficient; 3.50-4.49 – Highly Proficient; 2.50-3.49 – Moderately Proficient; 1.50-2.49 – Slightly Proficient; 1.00-1.49 – Non-Proficient

Table 2 presents the summary of teachers' technological proficiency which got a descriptive value of "highly proficient" and accumulated a weighted mean of 4.01. It implies that teachers competently apply the use of technology in their work. Teachers are "highly proficient" when it comes to productivity and professional practice that received the highest overall mean score of 4.10. While the domain assessment and evaluation was interpreted as "highly proficient" as well although it got the lowest average mean 3.95.

In order to be technology proficient, there should be opportunities offered to teachers for them to gain new skills, tools, experiences, and information that they can use in the classroom. As such, the results might be attributed to the various trainings attended by the teachers. As recorded, teachers in Candelaria East and West Districts attended different technology trainings such as the INSETs and LACs. Last 2021, a total of 180 teachers participated on the Google School-based Training while 130 teachers participated in 2022. It was also on the record that 46 elementary and 21 secondary teachers were given certificates as Google Educators Level 1, 3 teachers as Google Educators Level 2 and 1 teacher from Candelaria has been awarded and designated as the Google Ambassador and Trainer as Part of the DepEd Quezon's Project Google which aims to train teachers in utilizing Google Workspace Applications and hone their knowledge, skills and competencies that are needed to implement and integrate Google for Education Tools. This makes the Candelaria East and West Districts the most technology-advanced districts in the Division of Quezon. These emphasized the crucial role of workshops and pertinent trainings to support and facilitate creative methods in teachers' classrooms. Essentially, educators must be aware of the function and application of educational technology for the successful incorporation into today's classrooms particularly in the six constructions of teachers' technology standards.

The results of the overall teachers' technological proficiency agree to Basitere and Ndeto-Ivala (2017). According to them, teachers quietly contribute an excellent performance and a well-versed proficiency in technology. Similarly, results are congruent with Hero (2019) that teachers show proficiency in how they infuse technology in teaching inside the classroom and considering it as pedagogical innovation in the education paradigm.

Table 3*Summary Table on the Level of Teachers' Academic Optimism in School Improvement*

| Domains | Mean | Std. Deviation | Verbal Interpretation |
|----------------------|-------------|-----------------------|------------------------------|
| 1. Self-Efficacy | 4.10 | 0.62 | Oftentimes Positive |
| 2. Collective Trust | 4.28 | 0.63 | Oftentimes Positive |
| 6. Academic Emphasis | 4.26 | 0.65 | Oftentimes Positive |
| OVERALL | 4.21 | 0.63 | Oftentimes Positive |

Legend: 4.50-5.00 – Always Positive; 3.50-4.49 – Oftentimes Positive; 2.50-3.49 – Sometimes Positive; 1.50-2.49 – Slightly Positive; 1.00-1.49 – Always Negative

Table 3 summarizes the perceived extent of practices displaying the academic optimism of teachers in school improvement. The high level of academic optimism was manifested on the teachers' practices which actually means that the self-efficacy of teachers, the stakeholders' collective trust with each other and the collective effort to attain the highest performance in academics are "oftentimes positive" in their stations as it garnered an overall mean of 4.21. The highest mean of 4.28 was collective trust while the lowest average score of 4.10 was self-efficacy, which both indicate "oftentimes positive" when it comes to academic optimism. Since collective trust got the highest recorded mean among all the domains of academic optimism, it implies that individuals accept a certain degree of vulnerability when trusting relationships are established. In so doing, individuals optimistically open themselves and academic optimism will ensue.

The results were similar to the studies of Dean (2011) on the value of collaborative climate in schools, McGuigan and Hoy (2006) on the positive effects of academic optimism on teachers' goals, Woolfolk-Hoy et al. (2008) on the cognitive, affective, and behavioral components of optimism and Kurz (2006) on the elements of academic optimism.

The results in Table 4 revealed the difference on the perceptions of elementary and secondary teachers on school heads' technology leadership, teachers' technological proficiency, and academic optimism. There is no substantial difference between the perception of the elementary and secondary teachers when it comes to school head's technology leadership [$t(680)=1.614$; $p>.05$]; teachers' technological proficiency [$t(680)=-0.622$; $p>.05$]; and teachers' academic optimism [$t(680)=0.729$; $p>.466$]. Henceforth, the null hypothesis is NOT rejected. This means that the secondary and elementary teachers have the same perceptions and observations on their school heads technology leadership, as well as in their technological performance and level

of academic optimism when it comes to the application of the technology for school performance improvement. This might be because most of the respondents were already exposed to the use of different gadgets in teaching and working; they have internet connection at home and in school; they have an account/access in the online learning resource portals and information systems of DepEd; and they are using different software applications and websites for teaching and working.

Table 4

Difference on the Perceptions of Elementary Teachers and Secondary Teachers as to School Heads' Technology Leadership, Teachers' Technological Proficiency, and Academic Optimism

| Variables | Elementary | | Secondary | | t | df | Sig. (2-tailed) |
|-------------------------------------|------------|------|-----------|------|--------|-----|-----------------|
| | Mean | SD | Mean | SD | | | |
| School Heads' Technology Leadership | 4.02 | 0.76 | 3.92 | 0.77 | 1.614 | 680 | .107 |
| Teachers' Technological Proficiency | 3.99 | 0.64 | 4.02 | 0.64 | -0.622 | 680 | .534 |
| Academic Optimism | 4.22 | 0.58 | 4.19 | 0.64 | 0.729 | 680 | .466 |

This similarity of characteristics between the two set of respondents has also been affected by the mandate of the Department of Education long before the pandemic happened that technology must be integrated to the school systems (DO 23, S. 2004). The guidelines are hereby issued in order to efficiently and effectively manage the technology environment in the schools. Relevant to the DepEd Computerization Program (DCP), the distributions of appropriate technologies strengthened the digital capacity of schools, especially during the period of COVID-19 pandemic. Similarly, the release of DepEd Aide Memoire last May 27, 2020, updated on August 5, 2021, on the acceleration of the DepEd's Computerization Program in view of the Covid-19 pandemic as well as the "Digital Rise Program" anchored the infrastructure, software, and capacity building of learners and teachers in technology.

Presented on Table 5 is the result of the test of linear regression with teachers' technological proficiency as the dependent variable and the (6) domains of school heads' technology leadership as the independent variables.

Table 5*Predictors of School Heads' Technology Leadership on Teachers' Technological Proficiency*

Dependent Variable: Teacher's Technological Proficiency

| | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|-----------------------------------|-----------------------------|------------|---------------------------|--------|------|
| | B | Std. Error | Beta | | |
| (Constant) | 1.949 | .105 | | 18.499 | .000 |
| Social, Legal, and Ethical Issues | .345 | .044 | .434 | 7.898 | .000 |
| Leadership and Vision | .163 | .045 | .199 | 3.621 | .000 |

R = .609; Adj. R² = .369

F(2, 679) = 200.245; p < .01

The multiple regression analysis revealed that the social, legal, and ethical issues and the leadership and vision contributed significantly to the regression model $F(2, 679) = 200.245, p < .01$ and accounted for 36.9% of the variation in teachers' technological proficiency. Therefore, the model suggests that the school heads' technology leadership in terms of social, legal, and ethical issues and the leadership and vision significantly predict the teachers' technological proficiency.

The final regression model yielded a regression equation of:

$$TTP = 1.949 + .345 \text{ SLE} + .163 \text{ LV}$$

where:

TTP is the predicted Teachers' Technological Proficiency score;

SLE is the Social, Legal, and Ethical Issues score; and

LV is Leadership and Vision score

The equation further justifies that for every 1-unit increase in social, legal, and ethical proficiency score of school heads, there is a corresponding .345 units increase in teachers' technological proficiency. Likewise, for every 1-unit increase in the respondents' perceived leadership and vision of school heads, the model predicts .163 units increase in the technology proficiency of teachers. The school heads leadership practices when it comes to handling social,

legal, and ethical issues on the use of technology has the greatest positive effect on the teachers' technology proficiency.

The result indicates that the technology leadership practices by principals can strengthen the teachers' technology proficiency further. These findings bring to light where the ability of teachers to use ICT in the classroom is the result of a technology leader's good leadership and vision. Simultaneously, the principals' exemplary practices can follow by every teacher in ensuring that ICT used more legally, safely and ethically. These are crucial to increasing teachers' proficiency in technology use to produce technology-based pedagogy. However, there are still improvements that need to be implemented by principals to ensure that they fully master the character of technology leaders. The technology leadership competencies of the school heads on four more dimensions, namely: teaching and learning; productivity and professional practice; support, management, operations and finance; and assessment and evaluation must be improved from time to time. Logically, if principals' practice is reinforced, it is likely that these four elements can also have a significant impact on teachers' technological proficiency.

Effective principals do not accomplish their goals on their own. They develop the faculty's knowledge and abilities (Mendels, 2012), and provide professional development, create frameworks and chances for collaboration, and monitor teacher's work in the classroom (Louis et al. 2010). The basic purpose of teacher development is to increase the capacity of effective education, with student learning at its core.

The results of a linear regression test with teachers' academic optimism as the dependent variable and the (6) dimensions of school heads' technology leadership as the independent variables are shown in table 6.

The social, legal, and ethical issues; leadership and vision; productivity and professional practice and support; and management, operations, and finance contributed significantly to the regression model $F(4, 677) = 172.771$, $p < .01$ and accounted for 50.2% of the variation in teachers' academic optimism. As a result, the model implies that school heads' technology leadership in terms of social, legal, and ethical issues; leadership and vision; productivity and professional practice and support; and management, operations, and finance, has a substantial impact or significantly predict the teachers' academic optimism.

Table 6*Predictors of School Heads' Technology Leadership on Teachers' Academic Optimism*

Dependent Variable: Academic Optimism

| | Unstandardized Coefficients | | Standardized Coefficients | | |
|--|-----------------------------|------------|---------------------------|--------|------|
| | B | Std. Error | Beta | t | Sig. |
| (Constant) | 1.954 | .088 | | 22.149 | .000 |
| Social, Legal, and Ethical Issues | .317 | .049 | .427 | 6.416 | .000 |
| Leadership and Vision | .178 | .044 | .233 | 4.076 | .000 |
| Productivity and Professional Practice | .191 | .054 | .253 | 3.542 | .000 |
| Support, Management, Operations, and Finance | .131 | .050 | .179 | 2.630 | .009 |

R = .711; Adj. R² = .502

F(4, 677) = 172.771; p < .01

The regression equation for the final regression model was:

$$AO = 1.954 + .317 SLE + .178 LV + .191 PPP + .131 SMOF$$

where:

AO is the predicted Teachers' Academic Optimism score;

SLE is the Social, Legal, and Ethical Issues score;

LV is Leadership and Vision score;

PPP is Productivity and Professional Practice score; and

SMOF is Support, Management, Operations and Finance score

The equation also demonstrates that for every 1-unit growth in school heads' social, legal, and ethical proficiency, teachers' academic optimism increases by .317 units. Similarly, the model predicts a .178-unit increase in teachers' academic optimism for every 1-unit increase in respondents' perceptions of school leaders' leadership and vision. Likewise, it is expected that in every 1-unit increase in the productivity and professional practice of the school heads, there is

corresponding .191-unit escalation in the academic optimism score. Similarly, every 1-unit rise in school heads' scores in support, management, operations and finance, there is equivalent .131 additional to academic optimism scores. Teachers' academic optimism is boosted the most by school leaders' leadership in terms of managing social, legal, and ethical issues on the use of technology.

The findings show that the four dimensions of school heads' technology leadership have high positive effects on teachers' academic optimism. As such, these are necessary for enhancing teachers' academic optimism in school progress during the COVID-19 period, that is greatly affected by the impact of technology applications and usage. Nevertheless, principals still need to make reforms to guarantee that they are completely contributing to the academic positivity. Teaching and learning, as well as assessment and evaluation, must be enhanced on a regular basis. If principals' practices are reinforced, it is reasonable to assume that these two factors will have a considerable impact as well on teachers' academic optimism.

Principals' leadership style may influence teachers' perception towards academic optimism that results in positive school-related outcomes. As Anderson (2012) highlighted that when school structure is enabling, teachers are likely to engage in learning. Therefore, teachers' altruistic behaviors prompt dynamics between enabling school stature and school academic optimism.

5. Conclusion

This study delved deeper into the impact of school leaders' technology leadership on teachers' technological proficiency and academic optimism during the COVID-19 pandemic. Based on the results, there is no substantial difference between the perception of the elementary and secondary teachers when it comes to the variables. On the other hand, this study proved that there is a significant relationship between the school heads' technology leadership, teachers' technological proficiency and academic optimism. The school heads' technology leadership standards that predict the teachers' technological proficiency are the social, legal, and ethical issues and, the leadership and vision. These findings bring to light where the ability of teachers to use ICT in the classroom is the result of a technology leader's good leadership and vision. Simultaneously, the principals' exemplary practices can follow by every teacher in ensuring that

ICT used more legally, safely and ethically. These are crucial to increasing teachers' proficiency in technology use to produce technology-based pedagogy. While the parameters that predict the teachers' academic optimism are the social, legal, and ethical issues, leadership and vision, productivity and professional practice, and the support, and management, operations, and finance based on the regression analysis. These are necessary for enhancing teachers' academic optimism in school progress during the COVID-19 period, that is greatly affected by the impact of technology applications and usage. Nevertheless, principals still need to make reforms to guarantee that they are completely contributing to the academic positivity.

The results of the study may serve as the foundation to include the nature and concept of digital citizenship in school management and leadership. DepEd may include this training in the School Head's Development Program, as one of the foundational courses of leadership for the school principals.

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