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School Heads' Technological Leadership and Teachers' ICT Integration Employed in Teaching

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Abstract*: The purpose of this study was to determine the school heads' demonstrated technological leadership in terms of Equity and Citizenship Advocate, Visionary Planner, Empowering Leader, Systems Designer, Connected Learner, and the teachers' ICT integration employed in the delivery of instruction determined along Substitution, Augmentation, Modification, and Redefinition. This study also sought to investigate if a significant relationship existed between these two variables. A quantitative design was used, specifically the descriptive-correlational design utilizing a modified survey questionnaire checklist to gather data. The respondents were 291 teachers from the seven public secondary schools in the 1st Congressional District of the Schools Division of Zamboanga del Norte, conducted from November to December 2021 SY 2021-2022. Data were analyzed using frequency and percentage distribution, Chi-square test of homogeneity, and Chi-square test of association. The study found that school heads demonstrated technological leadership roles, and teachers employed ICT integration to deliver instruction. Results revealed no significant difference in ICT integration among teachers when grouped according to age, sex, position title, school assignment, educational background, and length of service. Moreover, there was a significant relationship between school heads' technological leadership and teachers' ICT integration employed in teaching. Thus, recommendations were drawn: school heads may continuously perform and strengthen their demonstrated technological leadership to maximize support to teachers in ICT integration along Redefinition; and teachers may integrate ICT along Redefinition, which offers redesigned, transformed, and innovative teaching and learning process.*

Keywords: *ISTE, SAMR model, school heads' technological leadership, teachers' ICT integration*

1. INTRODUCTION

The education sector has acknowledged the advancement of technology as a breakthrough that opened new possibilities and opportunities. Its integration improves the delivery of quality, effective, and responsive education as it has been empirically proven to provide innovative educational approaches to teachers and students (Ahmadi, 2018). In the school setting, harnessing this potential will need school heads to take over Information and Communications Technology's (ICT) power to produce significant enhancements. The need to harmoniously integrate ICT from school operations to classroom instruction makes it imperative for school heads to exercise technological leadership (Apsorn et al. 2019).

Technological leadership is the school head's role which comprises all technology-related activities, including organizations' decisions, technology implementation, and school policy instigation (Thannimalai and Raman 2018). This role requires them to be equipped with ICT knowledge, skills, and attitude to promote, apply, and spearhead ICT-driven initiatives in the entire school (Elbasri 2018).

The International Society for Technology in Education (ISTE) standards for education leaders and the National Competency-Based Standards for School Heads (NCBSSH) provide school heads with a framework for effective practice in the field (Department of Education [DepEd] 2010; ISTE 2018). However, in most studies conducted worldwide, ISTE standards offered a more prescriptive set of competencies and underscored technological leaders' challenging roles (Hero 2020; Raman and Thannimalai 2019; Ünal et al. 2015; Yahya and Raman 2020).

On the other hand, teachers are also involved in infusing ICT focused on the teaching and learning environment. Teachers' ICT integration refers to using ICT resources, such as computers, laptops, dedicated software, and the Internet, among others, in daily instructional activities to enhance and transform the educational environment (Hew and Tan 2016). The DepEd's Philippine Professional Standards for Teachers (PPST) necessitates teachers to incorporate ICT in developing, organizing, and applying suitable instructional materials to achieve learning goals (DepEd 2017). This demand for teachers to integrate ICT has increased with the challenges brought by the COVID-19 pandemic, where instruction shifted from face-to-face to distance learning (Agaton and Cueto 2021). ICT integration has been crucial in enabling the continuation of education while ensuring everyone's health and safety. However, Razak et al. (2019) posited that its success depends on school heads' leadership and competence for teachers to adapt to

technological changes and reap optimal benefits. Hence, the effective technological leadership of school heads makes it essential for teachers' ICT integration in instruction.

With this, the path-goal leadership theory, postulated by Robert House in 1971 and reviewed in 1996 (Okeke 2019), can be regarded as valuable. It claims that school heads' behavior enhances "follower performance and satisfaction by focusing on follower motivation" (Northouse 2016, as cited in Okeke 2019, p. 115). It supports the idea that school heads' behavior being the leader in an organization is involved in followers' performance or the teachers' performance in employing ICT integration in their lessons. The school heads' performance can be translated to how they play as technological leaders.

Premised on these, successful ICT utilization in the school will always require both roles as indispensable. Thus, it can be argued that it is imperative and relevant to explore both variables. However, the literature review reveals no extensive investigation regarding school heads' technological leadership and teachers' ICT integration in the country and the local schools division.

There were studies that examined school heads' technological leadership role using the five (5) dimensions of 2018 ISTE standards for education leaders, such as Equity and Citizenship Advocate, Visionary Planner, Empowering Leader, Systems Designer, and Connected Learner (Bass 2019; Rateno 2019). However, no studies were conducted in the Philippine or Zamboanga Peninsula context. The 2018 ISTE standards for education leaders were chosen because these are global standards. They provide a well-defined set of competencies, behaviors, and knowledge required for school heads to lead in this digital age. These standards stipulate a comprehensive roadmap encompassing technology's successful integration and application in schools worldwide (ISTE 2018).

Furthermore, there were also studies that evaluated teachers' ICT integration using the SAMR Model (Jude et al. 2014; Tseng 2019). However, the studies were conducted in other countries, and hardly any were conducted in the Philippines. This SAMR Model, as introduced by Puentedura (2006, as cited in Tseng 2019), means Substitution, Augmentation, Modification, and Redefinition. This model clearly defines how ICT can be integrated sequentially into instruction (Jude et al. 2014). Thus, serving as a helpful instrument for teachers to measure and reflect on their ICT integration to enhance learning.

Along with this context, this research was conducted to determine the association between school heads' technological leadership and teachers' ICT integration considering the 2018 ISTE standards for education leaders and the SAMR Model, particularly among secondary schools in the 1st Congressional District of the Schools Division of Zamboanga del Norte. The research output shall widen the understanding of how school heads' technological leadership correlates with teachers' ICT integration in classroom instruction. Moreover, it shall serve as input to the DepEd officials, particularly the personnel selection committee, in considering technological competencies among school heads and teachers' capability to employ ICT integration in the delivery of instruction during the hiring process. Also, this investigation shall provide school heads with a baseline on successfully creating and promoting a supportive environment for teachers and students to effectively utilize ICT in teaching and learning. Furthermore, the information on the teachers' ICT integration shall serve as a basis for developing an intervention to maximize their potential in utilizing ICT in the delivery of the lessons and for personal and professional development.

2. LITERATURE REVIEW

2.1 Technological Leadership

Al-Harthi's (2017) and Apsorn et al.'s (2019) studies helped distinguish technological leadership competencies, qualities, and roles. However, based on the reviewed related literature (Hero 2020; Thannimalai and Raman 2018; Uğur and Koç 2019; Yahya and Raman 2020), no further studies have been conducted that utilized their identified components. Instead, the ISTE standards for administration were the most used in gauging school heads' status of technological leadership in the schools. The ISTE is an organization focusing on educational technology, working with the education community worldwide.

In 2018, ISTE streamlined the standards and came up with Standards for Education Leaders, underscoring critical impact areas (ISTE 2018). It outlined five updated (5) dimensions: Equity and Citizenship Advocate, Visionary Planner, Empowering Leader, Systems Designers, and Connected Learner. The Equity and Citizenship Advocate dimension requires school leaders to use technology to increase inclusion, digital citizenship, and equity in schools. The Visionary Planner dimension refers to technology leaders' role in developing a shared strategic plan and vision articulating how ICT will improve student learning. The Empowering Leader dimension involves creating a school culture where learners and teachers are empowered to integrate technology into innovative strategies to enhance teaching and learning. Technology leaders, as Systems Designers, establish systems and teams to implement, sustain, and continuously improve ICT utilization to support learning. The Connected Learner dimension requires school heads to promote and model continuous professional development for themselves and others by staying abreast of emerging technologies for innovation in pedagogy, learning, and advancements in learning sciences (ISTE 2018).

Rateno's (2019) study utilizing the said standards showed that Ohio school heads, on average, were somewhat proficient in each of the dimensions of the technology leadership standards. The result implies that school heads' technological leadership was generally at minimum proficiency and somewhat informed of the required competencies for technological leadership. Moreover, Bass (2019)

found that school heads in South Dakota put a premium on their roles as Connected Learners and Empowering Leaders. However, they need to enhance their competence as System Designers.

The investigations conducted in Rateno (2019) and Bass (2019) were the only studies that utilized the latest ISTE standards for education leaders. Hence, examining technology leadership employing the newest ISTE standards for education leaders is scarce.

In the Philippines, school heads are likewise required to function as technology leaders, according to the DepEd's NCBSSH. Its competencies encompass leadership in technology use in the school for management and learning environment. However, it was found that using the NCBSSH to gauge school heads' technological leadership is not enough. NCBSSH does not cover all expected competencies than the ISTE standards for education leaders, which exhibit a more prescriptive skillset.

2.2 Teachers' ICT Integration

A model called SAMR was developed by Puentedura (2006, as cited in Tseng 2019) for teachers to gauge their ICT integration levels. The term SAMR means Substitution, Augmentation, Modification, and Redefinition. Substitution refers to ICT as a direct substitute without a change in its function (Tseng 2019). An example of this is to give reading text online instead of photocopies. Since the content was not changed, this is considered at the substitution level (Lacruz 2018). Augmentation is a substitution with a change in its function (Tseng 2019). For instance, a dictionary search incorporated in the given reading text online can be viewed at the augmentation level (Tseng 2019). Based on the SAMR model, these two levels are defined to be in the category of enhancement (Lacruz 2018). In this category, ICT enhances the teaching and learning process (Jude et al. 2014).

Moreover, Modification involves using ICT to redesign a task significantly (Jude et al. 2014). An example is using a multimedia application to annotate the reading text online (Tseng 2019). Redefinition refers to using ICT as a tool to create new tasks (Tseng 2019). To illustrate, using a mind-mapping application to present the reading text's visual elements can be considered at the redefinition level. The remaining two levels belong to the transformation category. With this, ICT is used to transform the teaching and learning process as the tasks are significantly modified and restructured. Jude et al. (2014) posited that the substitution level translates to a primary degree of integration in this model, while the redefinition level is equivalent to an advanced degree of integration. This model clearly defines how ICT can be integrated sequentially into instruction without leaping any development level (Jude et al. 2014). Thus, serving as a valuable instrument for teachers to measure and reflect on their ICT integration.

Jude et al.'s (2014) study revealed that preparing instruction notes, examinations, and assignments is the most common in the substitution level. Teachers use word processing software instead of handwritten. Tseng (2019) also found that using tablets as a substitute to deliver EFL lessons in a traditional teacher-centered classroom generally enhances teachers teaching. Moreover, his study found that teachers integrate ICT at the augmentation level that aids their research work rather than their instructional activities. Teachers use search engines in their research work most frequently at the augmentation level, succeeded by editorial tools in word processors, digital dictionaries, and digital libraries. While interactive social applications like Skype offer a ubiquitous reach to learners and teachers, their use is uncommon. The study claimed that it could be associated with insufficient knowledge by the teachers and students on their usage and the technologies necessary to implement such tools. This result revealed that ICT integration in pedagogical activities is primarily employed at the Substitution than at the augmentation level. Furthermore, the results showed that most teachers had never used ICT to redesign a task. For instance, teachers had never utilized video conferencing tools due to a lack of facilities and knowledge. The study further claimed that the school must put in much effort to improve ICT use to modify the teaching and learning process.

In recent studies conducted by Almalki (2020) and Thannimalai and Raman (2018), they agreed that teachers have a high level of ICT integration in the classroom. However, Michael et al. (2016) showed that only a few teachers use ICT in instruction due to their limited technological capabilities. Similarly, Yahya and Raman's (2020) study found that teachers have a moderate computer use level in classroom management and instruction. While these studies are limited, they still provide a sneak peek of teachers' ICT integration. However, these researchers utilized varied instruments to measure teachers' degree of ICT integration, and none of them employed the structured SAMR model. With Puentedura's (2006, as cited in Tseng 2019) SAMR model, teachers are steered and directed towards advancing their ICT pedagogical integration.

In the country, the Philippine Professional Standards for Teachers (PPST) provides a roadmap for teachers to implement and adhere to, where technical knowledge and skills are necessary to become technologically skilled. It requires teachers to include ICT in developing, organizing and applying suitable teaching and learning materials in addressing learning goals (DepEd 2017). However, it fails to assess the ICT integration among teachers comprehensively. Moreover, based on the review of related studies, there has been no extensive investigation regarding teachers' ICT integration level in the country and the local schools' division.

2.3 School heads' Technological Leadership and Teachers' ICT Integration

While teachers play an essential catalyst in assuring that educational technology is achieved, achieving this assurance is determined fundamentally by school heads' involvement in ICT integration (Wei et al. 2016; Omwenga et al. 2015). Similarly, Razak et al. (2019)

agree that school heads are essential to positive ICT integration among teachers. Thus, it makes it easy to see the existing link between school heads' technological leadership and teachers' ICT integration as further substantiated by empirical studies examining its relationship. For instance, studies conducted by Omwenga et al. (2015), Raman and Shariff (2017), and Thannimalai and Raman (2018) revealed a positive connection between school heads' competency in technology and teachers' ICT integration. Moreover, Wei et al. (2016) concluded that teachers' ICT competency increases if their school heads practice a higher technological leadership level. These findings reveal that school heads' technological leadership is a good predictor of teachers' ICT integration.

Literature has also acknowledged essential factors that contribute to and affect the said relationship, such as support from school heads, professional development, and school heads' ICT competency. Gürfidan and Koç (2016), Kafyulilo et al. (2015), Omwenga et al. (2015), and Samancioğlu et al. (2015) agree that school heads' establishment of support services, follow up and understanding of ICT infusion plays an essential role in teachers' constant use of ICT in teaching. School heads' provision of continuous professional development has also been perceived to impact teachers' ICT integration in the teaching and learning setting (Omwenga et al. 2015; Thannimalai and Raman 2018). At the same time, school heads' ICT competency is also vital in training teachers in performing tasks that require technical knowledge and skills (Wei et al. 2016). Hence, their ICT competency creates a domino effect on teachers, resulting in both being competent in using ICT. These identified factors corresponded with Moore's (2018) proposed three school head leadership traits perceived by teachers to influence ICT use in the classroom significantly. These are school-head-led hands-on ICT training opportunities, school head attitude towards ICT and its integration, and school-head-led ICT support.

Therefore, if school heads become more conscious of technological leadership's various roles and dimensions, they can accomplish more for their teachers' ICT competence development (Wei et al. 2016). Additionally, Yahya and Raman (2020) suggest that when school heads recognize their role as technology leaders, they will improve schools' ICT use. Simply put, teachers will be significantly influenced to accept and adopt ICT integration when school heads are prepared for their demanding role as technological leaders.

With these expressly conveyed, the researcher was directed to examine the relationship between school heads' technological leadership and teachers' ICT integration. The dimensions stipulated in the ISTE standards for education leaders helped the researcher gauge school heads' competencies in exercising their function as technological leaders. The standards encapsulate the qualities and competencies of an effective technology leader into five (5) dimensions: Equity and Citizenship Advocate, Visionary Planner, Empowering Leader, Systems Designer, and Connected Learner. Moreover, the research investigated teachers' ICT integration through the lenses of the SAMR model developed by Puentedura (2006, as cited in Tseng 2019), which stands for Substitution, Augmentation, Modification, and Redefinition. This model served as a valuable instrument in the study to measure teachers' ICT integration in the teaching and learning process.

3. METHOD

The study used a quantitative approach by which the researcher collected numerical data from the respondents. Specifically, this used a descriptive-correlational design to determine the school heads' demonstrated technological leadership as perceived by the teachers and teachers' ICT integration employed in the delivery of instruction. Employing the design, it also examined if a significant relationship existed between these two variables. The descriptive-correlational design is appropriate when describing research variables and investigating their natural associations or relationships (Sousa, Driessnack and Mendes 2007, as cited in Lemboye 2019).

The study used a modified survey questionnaire to gather information. The research instrument had three parts. The first part gathered data on the profile of the respondents, such as age, sex, position title, school assigned, educational background, and length of service as a teacher. The second part was a modified questionnaire that gathered data to describe school heads' technological leadership based on the five (5) domains of the 2018 ISTE Standards for Education Leaders. The third part was a modified survey questionnaire adapted from Jude et al. (2014) based on the SAMR model developed by Puentedura (2006, as cited in Tseng 2019) for teachers.

Since the study used an adopted survey questionnaire to gather information, the reliability and validity of the questionnaire had already been established by prior researchers. However, since it was modified and contextualized to fit the context of the study, the questionnaire underwent content validation. Three (3) external experts in assessment and educational technology assessed its content validity. The "Modified 2018 Principals Technology Leadership Survey" generated a Cronbach alpha internal consistency coefficient of .761. Meanwhile, .800 was the Cronbach alpha internal consistency coefficient for the "Teacher's ICT Integration in Classroom Teaching Survey." These results were then compared to Ogbazi and Okpala's (1994, as cited in Delas Peñas and Salundaguit 2019) criteria which considered .60 acceptable for good instruments. Thus, with the generated results, the tool was deemed reliable.

Furthermore, the study employed purposive sampling. Purposive, non-random sampling is applied to work with a group of individuals who have or meet specific criteria (Büyüköztürk et al. 2012, as cited in İnce et al. 2020). In the context of this study, the researcher set the criteria such as, in Congressional District I of the Schools Division of Zamboanga del Norte, only the seven (7) main public secondary schools are equipped with more ICT equipment and received at least three (3) DCP packages in the last five (5) school years compared to the rest of the secondary public schools which had received only one (1) or two (2) DCP packages in the last five (5) school years. In addition, these seven (7) main public secondary schools had access to internet connectivity through a

wired connection and cellular networks or mobile Internet. Compared to the other public secondary schools, they do not have available means to connect to the Internet and other ICT media. It was also observed that these seven (7) main public secondary schools were usually requested to participate and represent their municipalities during convergences hosted by the Schools Division. Moreover, they were considered the main public secondary schools in the seven (7) municipalities by the Schools Division of Zamboanga del Norte through an Unnumbered Division Memorandum dated May 2, 2019, issued by Pedro Melchor M. Natividad, CSEE (DepEd-Zamboanga del Norte 2019). Hence, the study purposively selected the seven (7) main public secondary schools. With these, the researcher believed that the 291 respondents from these schools provided essential data for attaining the research objectives.

The researcher sent a letter to the Schools Division of Zamboanga del Norte, asking permission to conduct the study in the identified schools. The endorsement letter from the superintendent with the researcher's letter was sent to the school heads seeking authorization to administer the questionnaire in their schools. Upon approval, the researcher personally administered the questionnaire by visiting each school.

The data gathered were treated with maximum confidentiality and used only in this study. Further, the researcher ensured that the anonymity and privacy of individual respondents were of utmost consideration. Informed consent was secured, and each respondent was personally asked if he/she was willing to participate. If the identified respondents opted not to respond for reasons like not wanting to participate, the respondent was not threatened or forced. The respondents' rights were respected, especially if they were not comfortable answering the questions given by the researcher.

The data collected were analyzed and interpreted using frequency count and percentage. The Chi-square test of homogeneity was used to determine if there was a significant difference in ICT integration employed in the delivery of instruction among teachers when grouped according to profile. The Chi-square test of association was also used to examine if there was a significant relationship between school heads' technological leadership and teachers' ICT integration.

Moreover, to determine the direction of the respondents' responses per technological leadership domain, technological leadership as a whole, and ICT integration, the percentage of the respondents' "Yes" responses was interpreted using the following range (AlZahrani et al. 2019):

Range	Direction
0% - 50%	No
51% - 100%	Yes

Additionally, the school heads' demonstrated technological leadership and teachers' ICT integration was interpreted whether it was "High" or "Low." In determining the 2-point scale interval, it utilized the formula for estimating a proportion (Walpole et al. 2012). It yielded 55.74%, which was used as a point of reference in determining the level of the school heads' demonstrated technological leadership and teachers' ICT integration. Hence, the following range was used:

Range	Interpretation
0% - 55.73%	Low
55.74% - 100%	High

The data gathering methods chosen and employed satisfy and align with the nature and purpose of the study. The survey questionnaire allowed the researcher to gather responses based on the respondents' general observations of the specific statements. The method enabled the study to gather and analyze data that helped describe, observe, and document the correlation or relationship among variables.

4. Results and Discussion

Table 1: Profile of Public Secondary Teachers

	Frequency	Percent
35 years old and below	120	41.3
36-45 years old	104	35.7
46-55 years old	46	15.8
56 years old and above	21	7.2
Male	77	26.5
Female	214	73.5
Teacher I	119	40.9
Teacher II	98	33.7

Teacher III	59	20.3
Master Teacher	15	5.1
School 1	56	19.24
School 2	53	18.21
School 3	50	17.18
School 4	37	12.71
School 5	35	12.03
School 6	33	11.34
School 7	27	9.28
Baccalaureate Degree	33	11.3
With Master's Units	176	60.5
With Master's Degree	73	25.1
With Doctoral Units	7	2.4
With Doctoral Degree	2	0.7
Less than 5 years	103	35.4
5 to 10 years	94	32.3
11 to 15 years	27	9.3
16 to 20 years	22	7.6
21 years and above	45	15.4

Data indicates that most teacher respondents were 35 years old and below. Most were females holding Teacher I and Teacher II positions with Master's Units and had less than five (5) years of service in the department. Moreover, half of them came from the district's three (3) large schools: School 1, School 2, and School 3.

4.1 Technological Leadership Role of Public Secondary School Heads

The table shows that the overall path of all five domains in school heads' technological leadership points to the "Yes" direction, which yielded 86.35 percent. Moreover, it disclosed that they demonstrated technological leadership at a high level. Therefore, it can be concluded that the school heads had seen and considered the vital roles of technology in the school, particularly in the teaching and learning environment. Moreover, with all five (5) domains demonstrated by school heads, it can be deduced that they possess the required technical competence and proficiency. This result backs up Rateno's (2019) findings that school principals in Ohio are relatively proficient in all technological leadership standards.

Table 2: Data on Technological Leadership Roles of Public Secondary School Heads as Perceived by Teachers

Technological leadership role	Yes		No		Total	Direction	Interpretation	Rank
	F	%	F	%				
Equity and Citizenship Advocate	248	85.29	43	14.71	291	Yes	High	3
Visionary Planner	245	84.33	46	15.67	291	Yes	High	4
Empowering Leader	263	90.38	28	9.62	291	Yes	High	1
Systems Designer	245	84.12	46	15.88	291	Yes	High	5
Connected Learner	255	87.63	36	12.37	291	Yes	High	2
Average	251	86.35	40	13.65	291	Yes	High	

Furthermore, Empowering leadership is the most dominant technological leadership role demonstrated by school heads, with 263 "Yes" responses or 90.38 percent of the respondents. This result connotes that school heads promote and create a climate where teachers and learners are empowered to use ICT integration as a cutting-edge to improve teaching and learning. The result corroborates Bass's (2019) findings that this role was perceived as the most important and one of the primarily focused responsibilities of secondary school heads in South Dakota.

4.2 ICT Integration Employed by Teachers in the Delivery of Instruction

Table 3: ICT Integration Employed by Teachers in the Delivery of Instruction

ICT Integration	Yes		No		Total	Direction	Interpretation	Rank
	F	%	F	%				
Substitution	231	79.52	60	20.48	291	Yes	High	2
Augmentation	262	90.03	29	9.97	291	Yes	High	1

Modification	213	73.20	78	26.81	291	Yes	High	3
Redefinition	151	51.75	140	48.25	291	Yes	Low	4
Average	214	73.63	77	26.38	291	Yes	High	

The table shows that most teachers integrate ICT since the overall result steers in the "Yes" direction with 73.63 percent. Moreover, they infuse ICT in teaching at a high level. This result means that most teachers highly employ ICT integration in delivering instruction in public secondary schools. Hence, it can be inferred that the teachers highly recognize and embrace ICT integration in teaching and learning. This result strengthens the findings of Almalki (2020), Raman et al. (2019), and Thannimalai and Raman (2018) that teachers integrate ICT in the teaching and learning process.

Furthermore, teachers dominantly employ Augmentation as ICT integration with 90.03 percent. This finding implies that teachers use ICT the most as a direct substitute for a traditional teaching method but with significant augmentations. It is followed by Substitution with 79.52 percent. In Puentedura's SAMR model, Substitution and Augmentation are in the enhancement category, while Modification and Redefinition are in the transformation category. Therefore, the result can be further deduced that most teachers employ ICT integration, focusing on enhancing rather than transforming the students' learning experience. This result supports Tseng's (2019) finding that teachers mainly utilize Augmentation and Substitution as ICT integration based on the SAMR model, with a few teaching methods that reach the transformation category.

4.3 ICT Integration among Teachers according to their Profile

Table 4: Difference in ICT Integration among the Respondents when Grouped According to Profile

Teachers' Profile	χ^2-value	p-value @ 0.05 level of significance	Interpretation
Age	3.992	.262	Not Significant
Sex	0.512	.474	Not Significant
Position Title	0.914	.822	Not Significant
School Assigned	0.894	.989	Not Significant
Educational Background	1.596	.660	Not Significant
Length of Service	5.125	.275	Not Significant

The table reveals no significant difference in ICT integration employed in the delivery of instruction among teachers when grouped according to profile. The results imply that the ICT integration among teachers across different profiles does not significantly vary. It further suggests that teachers integrate ICT regardless of age, sex, position title, school assignments, educational background, and length of service.

4.4 Relationship between School Heads' Technological Leadership Roles and Teachers' ICT Integration

Table 5: Test of Significant Relationship between School Heads' Technological Leadership Roles and Teachers' ICT Integration

Variables Correlated		p-value	Phi-value	Interpretation
Equity and Citizenship Advocate	Substitution	.065	0.08	Not Significant and Very Weak
	Augmentation	.078	-0.07	Not Significant and Very Weak
	Modification	.000	0.15	Significant and Very Weak
	Redefinition	.000	0.36	Significant and Moderate
Visionary Planner	Substitution	.133	0.06	Not Significant and Very Weak
	Augmentation	.035	-0.09	Significant and Very Weak
	Modification	.001	0.13	Significant and Very Weak
	Redefinition	.000	0.36	Significant and Moderate
Empowering Leader	Substitution	.000	0.15	Significant and Very Weak
	Augmentation	.889	0.01	Not Significant and Very Weak
	Modification	.000	0.22	Significant and Weak
	Redefinition	.000	0.42	Significant and Moderate
Systems Designer	Substitution	.133	0.06	Not Significant and Very Weak
	Augmentation	.035	-0.08	Significant and Very Weak
	Modification	.001	0.13	Significant and Very Weak
	Redefinition	.000	0.35	Significant and Moderate
Connected Learner	Substitution	.007	0.11	Significant and Very Weak
	Augmentation	.357	-0.04	Not Significant and Very Weak

	Modification	.000	0.18	Significant and Very Weak
	Redefinition	.000	0.39	Significant and Moderate

The result discloses that the five (5) dimensions of technological leadership roles have a statistically significant relationship with teachers' use of ICT along Modification and Redefinition. It is worth noting that Modification and Redefinition belong in the transformation category, where ICT transforms the teaching and learning process as the tasks are significantly modified and restructured (Jude et al. 2014; Lacruz 2018). Moreover, the result reveals that the strength of the relationship between the five (5) dimensions and Redefinition is consistently moderate. This further means that school heads' technological leadership roles are reasonably correlated with teachers' ICT integration that reaches the advanced category of redesigning the instruction.

On the other hand, the result indicates that the school heads' technological leadership roles have very weak correlations with Substitution and Augmentation. Furthermore, the result shows that the dimensions in technological leadership are mostly not significantly associated with teachers' use of ICT as a substitute for traditional teaching methods. This result means that school heads' technological leadership roles have minimal to negligible correlation with teachers' ICT integration. It further suggests that teachers integrate ICT integration along Substitution and Augmentation irrespective of school heads' technological leadership.

4.5 Relationship between School Heads' Technological Leadership and Teachers' ICT Integration

Table 6: Test of Significant Relationship between School Heads' Technological Leadership and Teachers' ICT Integration

Variables Correlated	p-value	Phi-value	Interpretation
Technological Leadership ICT Integration	.000	0.16	Significant and Very Weak

Since the p-value is less than 0.05 level of significance, there is sufficient evidence to conclude that Technological Leadership has a significant relationship with ICT integration. However, the phi-value of 0.16 translates to a very weak correlation. Though the strength of association is minimal, the relationship of both variables is still statistically significant.

The result implies that the school heads' technological leadership is significantly associated with teachers' pedagogical use of ICT. Hence, school heads' capability to navigate the school towards taking full advantage of technology correlates with teachers' ability to employ ICT in teaching.

The result is supported by the studies of Omwenga et al. (2015), Raman and Shariff (2017), and Thannimalai and Raman (2018) that teachers' ICT integration had a relationship with school heads' competency in technology. Moreover, the result parallels Razak et al. (2019) and Wei et al.'s (2016) deduction that school heads are vital catalysts in teachers' positive ICT integration. Moreover, their competency in ICT increases if their school heads practice a higher technological leadership level.

Furthermore, the results also support, reinforce and provide empirical evidence to the path-goal leadership theory postulated by Robert House in 1971 and reviewed in 1996 (Okeke 2019). Technological leaders guide, marshal, lead and provide directions to teachers in their ICT integration in instruction.

However, it is also worth noting that the study's findings are delimited to Congressional District I of the Schools Division of Zamboanga del Norte. Specifically, it included only the seven (7) main secondary public schools. Moreover, the results only covered the School Year 2021-2022.

5. Conclusion and Recommendation

Based on the results and findings, the researcher concluded that school heads in the 1st Congressional District of the Schools Division of Zamboanga del Norte demonstrated technological leadership. The high level of demonstrated technological leadership of school heads indicates that they have recognized and practiced the prescribed competencies outlined in the ISTE standards for educational leaders. Hence, they possess and showcase the dimensions, competencies, and proficiency needed as technology leaders to advance their roles in leading the school and teaching and learning landscape. Moreover, among the five (5) domains, they showed the most significant strength as Empowering Leader. Thus, this further disclosed that they create a climate where teachers and learners are empowered to use technology integration as a cutting-edge to improve teaching and learning. They inspire a school culture of collaboration and innovation that actively enables everyone to explore and integrate digital resources and tools.

The study also concluded that teachers employed ICT integration in the delivery of instruction. The high level of ICT integration revealed that teachers extensively embrace the pedagogical use of ICT. Moreso, they dominantly employed ICT integration along Augmentation. This result infers that they primarily utilized ICT to enhance rather than transform the teaching and learning process based on Puentedura's (2006, as cited in Tseng 2019) SAMR model.

Furthermore, the study deduced insufficient evidence of a significant difference in teachers' ICT integration when grouped according to profile. The researcher also concluded that the school heads' technological leadership is significantly associated with teachers' ICT integration. Although the strength of the correlation is generally minimal, it still provides empirical evidence that the relationship between both variables exists. It sheds more light on the phenomenon that school heads' technological competence to steer the school towards leveraging ICT correlates with teachers' infusion of ICT in teaching and learning. The finding also revealed that the technological leadership roles and Redefinition had a moderate relationship strength. Thus, school heads' technological leadership relates to how teachers embrace and take advantage of ICT to transform and redefine the learning experiences they provide for their learners.

Based on the result of the study, the following are recommended:

a. The DepEd personnel selection board may consider the capability of school heads to leverage ICT in schools and perform technological leadership during the hiring or promotion process. It may ensure they can embed ICT from school management to teaching and learning. Likewise, teachers' competence in employing ICT to enhance and transform traditional teaching methods, as outlined in Puentedura's (2006, as cited in Tseng 2019) SAMR model, may also be considered.

b. School heads may continuously perform and strengthen their demonstrated technological leadership to maximize support to teachers in ICT integration along Redefinition. These include, but are not limited to:

- providing stable internet connectivity in the school;
- modeling digital citizenship;
- implementing individualized school-based training and workshops on ICT integration along Modification;
- establishing a mechanism to address continuous improvement of teachers' advanced ICT integration;
- communicating effectively with stakeholders to gather input on the plan, celebrate successes, and engage in a continuous improvement cycle; and,
- staying up-to-date on technological innovations and advancements in pedagogy.

c. Teachers may integrate ICT more along Redefinition, which offers more redesigned and innovative learning experiences that facilitate the transformation of the teaching and learning process. These include, but are not limited to:

- using DepEd OER as study materials;
- using Google Classroom or any other learning management system to assess students' learning;
- maximizing the use of online tools that encourage digital collaboration, like Google Education applications, Microsoft Office 365, and the likes;
- employing electronic games and simulation; and,
- using digital platforms for students to publish their outputs online where peers and a broader audience can view them.

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