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Technological and Pedagogical Knowledge of Senior High School Teachers: Basis for an Enhancement Program

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Abstract: *This study assessed the technological and pedagogical competencies of Senior High School (SHS) teachers within the San Francisco District, Agusan del Sur. The research specifically focused on the disparity between teachers' self-efficacy beliefs and their demonstrated capacity to integrate technology effectively into classroom instruction. Employing descriptive-correlational methods, the study analyzed the relationships among teacher demographics, self-efficacy perceptions, and levels of technological knowledge. Data were collected through surveys and interviews. The findings indicated that while teachers reported high levels of self-efficacy, this did not consistently correlate with effective technological integration in their teaching practices. The study's results underscore the necessity for targeted professional development initiatives and have informed the proposal of an intervention program, Project TEACH, which aims to enhance teachers' technological and pedagogical skills. The implications of these findings emphasize the importance of ongoing, tailored support mechanisms to ensure that SHS teachers can effectively leverage technology to optimize student learning outcomes.*

Keywords: *Technological knowledge, Pedagogical knowledge, Teacher Self- Efficacy, Intervention program, TPACK, Senior high school teachers*

I. Introduction

The Philippine basic education curriculum, delivered through the K–12 program, endeavors to produce globally competitive graduates who are well-prepared for both the workforce and entrepreneurship. These programs are meticulously tailored to the comprehension levels of participants, ensuring adequate time for the mastery of crucial subjects. Educators play a pivotal role in fostering literacy among pupils, thereby empowering them to make informed decisions regarding the practical applications of scientific knowledge (Gamayao & Binas, 2021). Efficacious teaching tactics are paramount for cultivating competitive and relevant learning experiences. Competencies, encompassing essential knowledge and abilities, remain fundamental to teacher effectiveness, necessitating a synthesis of professional judgment and evidence-based skills to navigate the daily complexities of the classroom (Queroda & Nama, 2018).

In the Philippines, the Department of Education (DepEd) promulgates key policies aimed at enhancing the quality of teaching and ensuring that educators are well-equipped to meet the demands of 21st-century learning. DepEd Order No. 3, series of 2016, provides comprehensive guidelines for the recruitment of senior high school teachers, ensuring that only qualified and competent individuals are selected based on specific criteria aligned with the objectives of the K to 12 curriculum. A central tenet of teacher competence in contemporary education is the mastery of Technological Pedagogical Content Knowledge (TPACK)—a robust framework that seamlessly integrates technology with pedagogy and content knowledge. Educators possessing strong TPACK skills thoughtfully select and utilize digital tools, design engaging instruction, and scaffold students' understanding of intricate concepts. Through the effective application of TPACK, educators create interactive and technology-enhanced learning environments that support student achievement and prepare them for the exigencies of the digital world.

DepEd actively pursues strategic initiatives to fortify teachers' TPACK, recognizing its indispensable role in modern education. Through comprehensive capacity-building programs and targeted policy interventions, the Department emphasizes the synergistic integration of technology with content and pedagogy to optimize instructional effectiveness. TPACK empowers educators to select appropriate digital tools, adapt teaching strategies, and align lessons with curriculum standards. This integration enables teachers to better engage learners, foster deeper understanding, and

address the evolving needs of a technology-driven society. This proactive approach reflects DepEd's unwavering commitment to elevating teaching quality and promoting innovation across diverse learning areas.

Within the Division of Agusan del Sur, various training programs have been implemented to enhance teachers' technological and pedagogical capacities. These strategic initiatives are grounded in the conviction that effective education must seamlessly integrate technology to cultivate competent teachers who are adept at addressing the multifaceted demands of today's learners.

In the San Francisco District, where the researcher is currently assigned, it is evident that a segment of teachers lacks adequate knowledge and proficiency in ICT, particularly within the Senior High School level. Moreover, some educators are assigned to instruct subjects outside their area of specialization. In response to these observed needs, this study is designed to rigorously investigate the technological and pedagogical knowledge of Senior High School teachers within the district. The findings of this research will serve as the empirical basis for developing a targeted enhancement plan aimed at bolstering their competence and teaching effectiveness.

II. Method

This study employed a quantitative approach utilizing a descriptive-correlational research design. This design was selected as it is well-suited for examining the relationships between identified variables and providing a comprehensive analysis of the research problem. The descriptive component of the design enabled the researchers to systematically outline the profile of the teacher respondents, encompassing their academic rank, highest educational attainment, area of specialization, years of teaching experience, and levels of self-efficacy. This detailed profiling provided a foundational understanding of the teachers' backgrounds and how these characteristics might relate to their technological pedagogical knowledge.

Furthermore, the descriptive aspect of the methodology facilitated the assessment of Senior High School teachers' levels of Technological Pedagogical Knowledge (TPK) within the San Francisco District. By quantifying their knowledge in both technology and pedagogy, the study aimed to identify specific areas of strength and weakness. These identified areas are crucial for the subsequent development of targeted enhancement programs. The correlational component of the research design then explored the statistical relationships between the teachers' demographic profiles and their TPK levels. This analysis helped to identify significant patterns or associations between demographic factors, such as academic rank, educational attainment, and years of teaching experience, and the teachers' TPK competencies.

The study was conducted across the secondary schools within the San Francisco District of the Agusan del Sur Division. The target population comprised Senior High School teachers within this district who held regular or permanent positions and possessed at least one year of service within the Department of Education. A cluster sampling design with a random start was employed to select the study respondents. From a total population of 108 Senior High School Teachers, a proportionally stratified sample of 85 teachers was chosen from the different schools. The number of respondents selected from each school was calculated on a percentage basis, and individual respondents within each school were then randomly selected using a random number generator. Data were collected using an adopted and modified survey questionnaire, initially developed by Sariçoban et al. (2019) to assess the TPACK of pre-service English as a Foreign Language teachers. The questionnaire was divided into two sections: the first focused on the respondents' profiles, including academic rank, educational attainment, teaching experience, self-efficacy levels, and TPACK-related training; the second section comprised statements designed to assess their pedagogical proficiency and technological skills. The modified questionnaire underwent validation by three expert validators with training or demonstrated proficiency in TPACK and its reliability was established using Cronbach's alpha on a pilot sample.

III. Results and Discussion

Profile of the Respondents

The study examined Senior High School teachers' professional backgrounds and confidence by analyzing their teaching position/academic rank, highest educational attainment, areas of specialization, years of teaching experience, and self-efficacy levels. Understanding these variables is crucial for evaluating their teaching practices and effectiveness, and for identifying areas needing professional development to improve both teacher performance and student outcomes.

Teaching Position/Academic Rank

Academic rank, reflecting experience, qualifications, and service years, can influence teachers' familiarity with technology and pedagogy. Analyzing the distribution of teachers across ranks will help assess potential patterns in their knowledge levels and identify specific groups for targeted support.

The Profile of the Teachers in terms of Teaching Position/Academic Rank

Teaching Position	*Frequency*	*Percent*
Teacher I	49	*57.6*
Teacher II	24	*28.2*
Teacher III	8	*9.4*
Master Teacher I	1	*1.2*
Master Teacher II	3	*3.5*
Total	*85*	*100.0*

Teaching Position/Academic Rank

Table 2.1 shows that the majority of respondents (57.6%) are Teacher I, while Master Teacher I represents the smallest group (1.2%). This indicates a workforce primarily composed of entry-level teachers, with fewer in higher ranks. This aligns with Odigwe and Owan (2020), who suggest that increased administrative duties at higher ranks might reduce ICT engagement compared to classroom-focused roles.

However, Amhag et al. (2019) offer a contrasting view, suggesting that ICT access and integration perceptions are often similar across ranks due to widespread training opportunities. DepEd Order No. 5, s. 2015, further explains the lower Master Teacher I representation in ICT-focused data, as their roles often shift towards coaching and mentoring rather than direct classroom instruction. Overall, the data highlight the prevalence of lower-ranked teachers and how evolving professional responsibilities can affect ICT involvement in instructional settings.

Educational Attainment

Teachers' educational attainment provides insights into their qualifications and openness to innovative teaching practices. Higher education levels can significantly influence familiarity with advanced teaching methodologies and adaptability to new classroom technologies.

The Profile of the Teachers in terms of Highest Educational Attainment

Educational Attainment	***Frequency***	***Percent***
College Graduate	33	*38.8*
With MA units	19	*22.4*
Masters with CAR	20	*23.5*
Master's Degree	9	*10.6*
With Doctorate Degree units	2	*2.4*
Total	85	*100.0*

Table 2.2 indicates that the largest group of teachers (38.8%) are College Graduates, while the smallest proportion (2.4%) holds Doctorate Degree units. This distribution reveals that a significant segment of the teaching population possesses only undergraduate qualifications, with relatively few having pursued doctoral studies. This limited representation of teachers with advanced academic credentials may reflect trends in professional development opportunities or institutional support within the specific educational context under examination.

Kara (2021) has underscored the influence of teachers' Technological Pedagogical Content Knowledge (TPACK) on student learning outcomes, emphasizing that while students' academic self-efficacy is a strong predictor of

achievement, teachers' preparation and educational background remain crucial determinants of effective instruction. The observed low number of teachers with graduate-level education may reflect a variability in professional preparation that could impact the overall integration of TPACK within classroom practices.

Field of Specialization

The field of specialization of teachers play a significant role in shaping their technological and pedagogical knowledge. This provides insights into how teacher's subject expertise influences their ability to adopt and utilize educational technologies effectively.

The Profile of the Teachers in terms of Field of Specialization

Field of Specialization	*Frequency*	*Percent*
English	19	*22.4*
Filipino	5	*5.9*
Science	18	*21.2*
Social Science	13	*15.3*
Mathematics	15	*17.6*
MAPEH	4	*4.7*
TLE	11	*12.9*
Total	*85*	*100.0*

Table 2.3 indicates that the largest proportion of teachers specialize in English (22.4%), followed closely by Science (21.2%) and Mathematics (17.6%), highlighting a strong representation in core academic areas. Conversely, MAPEH (Music, Arts, Physical Education, and Health) has the lowest representation at 4.7%, suggesting a comparatively limited number of specialists in this field. The data reflect a higher concentration of educators in major academic subjects, while fields like MAPEH and Filipino have fewer teaching positions available within the Agusandel Sur Division and the specific schools and district.

Number of Years in Teaching

The duration of a teacher's experience in the profession can offer insights into how their tenure might influence their capacity to integrate technology and pedagogy effectively. Teaching experience reflects not only the depth of expertise but also plays a crucial role in teachers' adaptation to and integration of technological practices within the learning environment.

The Profile of the Teachers in terms of Number of years in Teaching

Years in Teaching	*Frequency*	*Percent*
0 – 3 years	46	*54.1*
4 - 6 years	22	*25.9*
7 – 9 years	12	*14.1*
10 years and above	5	*5.9*
Total	*85*	*100.0*

Table 2.4 reveals that the largest segment of teachers (54.1%) has 0–3 years of teaching experience, indicating a predominantly novice teaching force where over half have limited classroom experience. Conversely, the smallest group (5.9%) comprises teachers with 10 or more years of experience. Research suggests that while newer teachers may possess current theoretical knowledge, they often encounter challenges in effectively applying technological pedagogical knowledge (TPK) due to their limited practical experience (Çinar et al., 2021).

In contrast, studies by Almazroi and Shakib (2023) and Karmelita et al. (2022) highlight that more experienced teachers typically exhibit greater confidence and proficiency in technology integration, likely due to their extended

exposure and accumulated professional development. Although they constitute a smaller portion of the respondents, their expertise and instructional leadership remain influential within the teaching community.

Self-Efficacy of Teachers

Teacher self-efficacy, an individual's belief in their capability to perform teaching tasks and achieve educational goals, is a critical factor in the learning environment. It influences educators' approach to their responsibilities, their interactions with students, and their management of classroom dynamics. High self-efficacy is often associated with increased persistence, resilience, and a greater willingness to adopt innovative teaching strategies. Conversely, teachers with lower self-efficacy may face challenges in motivation and engagement, potentially impacting their effectiveness.

Understanding teachers' self-efficacy levels is vital for cultivating a supportive educational environment. This knowledge informs professional development initiatives by highlighting areas where additional resources and training may be necessary to empower educators in their roles. By identifying specific needs related to confidence in teaching abilities, schools can implement targeted interventions to build capacity and foster a more positive and effective teaching force.

Ultimately, a focus on enhancing teacher self-efficacy contributes to a more dynamic and successful learning environment for students. When teachers feel confident and capable, they are more likely to create engaging lessons, manage classrooms effectively, and ultimately improve student outcomes. Therefore, assessing and addressing self-efficacy is a crucial aspect of supporting educators and fostering a thriving educational community.

Level Of Self-Efficacy of The Teachers

Indicators	*Wtd Mean*	*Std. Deviation*	*Verbal Description*	*Self-Efficacy Level*
1. How much can you do to control disruptive behavior in the classroom?	4.32	0.862	Quite a Bit	*High*
2. How much can you do to motivate students who show low interest in school work?	4.34	0.907	Quite a Bit	*High*
3. How much can you do to get students to believe they can do well in school work?	4.60	0.676	A Gret Deal	*Very High*
4. How much can you do to help your students value learning?	4.48	0.881	Quite a Bit	*High*
5. To what extent can you craft good questions for your students?	4.41	0.761	Quite a Bit	*High*
6. How much can you do to get children to follow classroom rules?	4.49	0.718	Quite a Bit	*High*
7. How much can you do to calm a student who is disruptive or noisy?	4.40	0.775	Quite a Bit	*High*
8. How well can you establish a classroom management system with each group of student?	4.52	0.701	A Gret Deal	*Very High*
9. How much can you use a variety of assessment strategies?	4.20	0.897	Quite a Bit	*High*
10. To what extent can you provide an alternative explanation or example when students are confused?	4.48	0.734	Quite a Bit	*High*

11. How much can you assist families in helping their children do well in school?	4.29	0.857	Quite a Bit	*High*
12. How well can you implement alternative strategies in your classroom?	4.51	0.811	A Gret Deal	*Very High*
Overall Weighted Mean	*4.42*	*0.593*	*Quite a Bit*	*High*

Legend: 1.00-1.49-Nothing Very Low; 1.50-2.49-Very Little/Low; 2.50-3.49-Some Influence/Moderately High; 3.50-4.49-Quite a Bit/High; 4.50-5.00-a Great Deal/Very High

Table 3 indicates a high overall self-efficacy among teachers (weighted mean = 4.42, SD = 0.593), suggesting general confidence in various teaching aspects like classroom management, student motivation, instructional strategies, and family communication.

The highest self-efficacy was reported for "How much can you do to get students to believe they can do well in school work?" (mean = 4.60, "A Great Deal"), highlighting strong teacher confidence in fostering students' academic potential through encouragement, achievable goals, and individualized support.

Conversely, the lowest mean was for "How much can you use a variety of assessment strategies?" (mean = 4.20, "Quite a Bit"), indicating relatively less ease in implementing diverse assessment methods, possibly due to reliance on traditional tests influenced by familiarity, time constraints, or limited resources.

Manifestation of Senior High School Teachers' Technological Knowledge

These findings align with research by Ahmad et al. (2023) and Dicke et al. (2020), linking higher teacher self-efficacy to effective classroom management and adaptive teaching. Confidence in managing disruptive students (mean = 4.40) and ensuring rule adherence (mean = 4.49) supports this. Rais et al. (2022) note experience enhances self-efficacy, while Sánchez-Rosas et al. (2023) highlight the role of positive social interactions. Firmansyah et al. (2022) and Lin et al. (2022) also connect teacher self-efficacy to confidence in using digital tools and adapting instruction (mean for implementing alternative strategies = 4.51, crafting good questions = 4.41).

The study evaluated Senior High School teachers' proficiency and application of both technological and pedagogical knowledge to enhance student learning and engagement. Understanding these levels highlights educator strengths and areas for improvement, informing targeted professional development to foster innovative teaching practices in a technologically evolving landscape.

Table 4.1 indicates that the Technological Knowledge (TK) level of Senior High School teachers is generally very satisfactory (overall weighted mean = 3.51), suggesting a strong understanding and application of technology in their teaching. The highest mean (3.73) was for "Use ICT knowledge to solve complex problems and support student collaborative activities," reflecting confidence in using technology for collaboration and problem-solving, aligning with observed use of tools like Google Classroom and Padlet. The lowest mean (3.45), though still satisfactory, was for "Demonstrate social, ethical, and legal responsibility in the use of technology tools and resources," indicating slightly less strong agreement regarding ethical and legal technology use, potentially due to a greater focus on technical and pedagogical aspects over ethical considerations in professional development.

Level Of Manifestation of Senior High School Teachers' Knowledge in Terms of Technological Knowledge

Indicators As a SHS teacher, I….	*Wtd Mean*	*Std. Deviation*	*Verbal Description*	*TK Level*
1. *Demonstrate awareness of policies affecting ICT in education*	3.52	0.526	Strongly Agree	*Very Satisfactory*

2. Use ICT as a tool to develop 21st century skills:	2.93	0.856	Agree	Satisfactory
2.1. Information skills				
2.2. Media and Technology Skills	3.48	0.590	Agree	Satisfactory
2.3. Life and Career Skills	3.47	0.525	Agree	Satisfactory
2.4.Effective Communication Skills	3.53	0.569	Strongly Agree	Very Satisfactory
3. Use ICT knowledge to solve complex problems and support student collaborative activities	3.73	0.447	Strongly Agree	Very Satisfactory
4. Demonstrate proficiency in the use of technology tools to support teaching and learning	3.65	0.481	Strongly Agree	Very Satisfactory
5. Facilitate flexible learning environment that enhances collaboration with the use of technology tools	3.61	0.490	Strongly Agree	Very Satisfactory
6. Evaluate technology resources i n terms of:	3.74	0.441	Strongly Agree	Very Satisfactory
6.1. Appropriateness				
6.2.Quality	3.40	0.805	Agree	Satisfactory
6.3.Usability	3.54	0.547	Strongly Agree	Very Satisfactory
6.4.Accessibility	3.45	0.588		
6.5.Cost Effectiveness	3.66	0.524	Strongly Agree	Very Satisfactory
7. Demonstrate social, ethical, and legal responsibility in the use of technology tools and resources	3.45	0.608	Agree	Satisfactory
Overall Weighted mean	*3.51*	*0.363*	*Strongly Agree*	*Very Satisfactory*

Other indicators, such as "Demonstrate proficiency in the use of technology tools to support teaching and learning" (mean = 3.65) and "Facilitate flexible learning environments that enhance collaboration with the use of technology tools" (mean = 3.61), indicate general teacher confidence in leveraging technology to improve learning and create more flexible, student-centered environments, evidenced by rapid adaptation to online platforms during the pandemic.

The lower rating on ethical responsibility (mean = 3.45) might stem from the rapid integration of technology, prioritizing practical application over ethical implications. Professional development often emphasizes technical skills over topics like online safety and digital etiquette.

Manifestation of Senior High School Teachers' Pedagogical Knowledge

Table 4.2 shows that the overall level of Senior High School teachers' pedagogical knowledge is very satisfactory (overall weighted mean = 3.56), indicating strong general pedagogical competence. The highest-rated indicator is "Guide students' discussions during group work" (mean = 3.74), reflecting teacher effectiveness in promoting collaboration and interaction, as observed in active engagement in group activities across various subjects.

Level Of Manifestation of Senior High School Teachers Knowledge in Terms of Pedagogical Knowledge

Indicators In the teaching of my subjects, I…	*Wtd Mean*	*Std. Deviation*	*Verbal Description*	*PK Level*
1. *Guide students' discussions during group work*	3.74	0.441	Strongly Agree	*Very Satisfactory*

2. *Support students' critical thinking by feedbacking*	3.53	0.569	Strongly Agree	*Very Satisfactory*
3. *Guide students in planning their own learning*	3.47	0.569	Agree	*Satisfactory*
4. *Support students' reflective thinking by feedbacking*	3.52	0.503	Strongly Agree	*Very Satisfactory*
5. *Guide students to make use of each other's thoughts and ideas during group work.*	3.60	0.493	Strongly Agree	*Very Satisfactory*
6. *Support students' problem- solving skills by feedbacking*	3.55	0.500	Strongly Agree	*Very Satisfactory*
7. *Support students' creative thinking by feedbacking*	3.51	0.503	Strongly Agree	*Very Satisfactory*
Overall Weighted Mean	*3.56*	*0.383*	*Strongly Agree*	*Very Satisfactory*

Legend: 1.00-1.49-Strongly Disagree/Very Poor; 1.50-2.49- Disagree/ Poor; 2.50-3.49-Agree/ Satisfactory; 3.50-4.00-Strongly Agree/ Very Satisfactory

Manifestation of Senior High School Teachers' Pedagogical Knowledge (Continued)

The lowest-rated item was "Guide students in planning their own learning" (mean = 3.47, satisfactory), suggesting limitations in practices that foster student autonomy in structuring and managing their learning, often due to teacher-centered lesson plans with limited student decision-making in tasks or assessments.

These findings align with Mendoza et al. (2024), who noted senior high school teachers' very good competence, especially in using various teaching strategies and facilitating student engagement, as evidenced by high scores in supporting critical, reflective, and creative thinking through feedback.

Lu et al. (2021) further support these results, highlighting that strong pedagogical knowledge contributes to a well-managed and responsive learning environment, reflected in teachers' capability to support problem-solving (mean = 3.55) and guide the use of peer ideas during group work (mean = 3.60), fostering a critically thinking and interactive learning culture.

Significant Relationship between the Profile and their Level of Manifestation of Senior High School Teachers in Both Technological and Pedagogical Knowledge

Relationship Between Teacher Profile and Technological & Pedagogical Knowledge

Examining the relationship between Senior High School teachers' profiles (teaching position, educational attainment, specialization, experience, self-efficacy) and their technological and pedagogical knowledge is crucial for understanding effective teaching practices. Identifying how these factors influence technology integration and pedagogical strategy use is essential for developing targeted professional development programs that enhance teacher effectiveness and improve student learning outcomes. This exploration offers insights into how educators' unique profiles can foster more engaging and effective learning environments.

Table 5 indicates no statistically significant differences in technological and pedagogical knowledge levels across teacher profile variables (teaching position, educational attainment, specialization, teaching experience). All p-values exceeded the 0.05 threshold, suggesting a relatively uniform level of knowledge regardless of these factors. This consistency may reflect standardized training programs or the uniform implementation of educational policies influencing professional development.

Kruskal Wallis Test in the level of manifestation of the technological and pedagogical knowledge of the Senior High School Teachers when grouped according to profile

Profile Variable Grouping		*Technological Knowledge*	*Pedagogical Knowledge*
Teaching Position/Academic Rank	Chi square	.639	*2.041*
	p-value	.959	*.728*
	Decision on Ho	Do not reject Ho	*Do not reject Ho*
	Interpretation	Not significant	*Not Significant*
Highest Educational Attainment	Chi square	4.376	*8.013*
	p-value	.358	*.091*
	Decision on Ho	Do not reject Ho	*Do not reject Ho*
	Interpretation	Not significant	*Not significant*
Field of Specialization	Chi square	2.792	*6.793*
	p-value	.834	*.340*
	Decision on Ho	Do not reject Ho	*Do not reject Ho*
	Interpretation	Not significant	*Not significant*
Years in Teaching	Chi square	1.339	*.172*
	p-value	.720	*.982*
	Decision on Ho	Do not reject Ho	*Do not reject Ho*
	Interpretation	*Not significant*	*Not significant*

Analysis of Non-Significant Differences in Knowledge Levels

The researcher's observations in public senior high schools corroborate this finding, as teachers, irrespective of their position or years of service, often participate in similar in-service training programs conducted at the division or regional level. This standardized exposure likely contributes to the observed uniformity in their reported technological and pedagogical competencies.

This outcome resonates with the study by Amhag et al. (2019), which indicated that teachers across different academic ranks perceive similar obstacles to the integration of Information and Communication Technology (ICT), suggesting systemic barriers rather than issues specific to individual teacher profiles. The researcher's observations frequently reveal that both novice and experienced teachers report facing comparable challenges, such as limited internet access or outdated hardware, when attempting to incorporate technology into their instruction.

Furthermore, the absence of significant variation in knowledge levels across years of experience suggests that extended tenure does not automatically translate to greater technological or pedagogical proficiency. Within school settings, it is not uncommon to find veteran teachers who predominantly utilize traditional methods and exhibit less inclination towards adopting new technological tools, while younger teachers, despite having less experience, may demonstrate comparable or even superior proficiency due to their more recent exposure to digital tools during their formal education. This observation aligns with the findings of Odigwe and Owan (2020), who noted that increased academic rank may be accompanied by additional responsibilities that unintentionally diminish the time and focus allocated to the use of ICT for instructional purposes.

Significant Relationship between the Teachers' Level of Self-Efficacy and Level of Manifestation of the Technological and Pedagogical Knowledge of the Senior High School Teachers

The integration of technology in education has become increasingly vital for enhancing teaching effectiveness and student engagement. Within this framework, the interplay between teachers' self-efficacy and their levels of technological and pedagogical knowledge is paramount. Self-efficacy, defined as an individual's belief in their capacity to execute actions required to achieve specific goals, significantly influences educators' willingness to adopt innovative teaching methods and utilize technology effectively. For senior high school teachers, a high degree of self-efficacy in their technological and pedagogical knowledge can foster more dynamic and responsive teaching practices that cater to diverse

student needs. This study investigates the significant relationship between teachers' self-efficacy and the manifestation of their technological and pedagogical knowledge, highlighting how confidence in their abilities can enhance their instructional practices and ultimately improve educational outcomes. By understanding this relationship, educational stakeholders can develop targeted enhancement programs that bolster teachers' self-efficacy, leading to more effective integration of technology in the classroom and enriched student learning experiences.

Table 6 presents the correlation between teachers' level of self-efficacy and their manifestation of technological and pedagogical knowledge. The data indicate that the mean value for technological knowledge is higher than that of pedagogical knowledge, suggesting that teachers generally report greater familiarity and confidence with the use of technological tools compared to applying pedagogical strategies. The correlation analysis revealed a weak negative relationship between self-efficacy and both technological knowledge ($\rho=-0.124, p>0.05$) and pedagogical knowledge ($\rho=-0.087, p>0.05$). This suggests a slight tendency for higher self-efficacy to be associated with marginally lower reported levels of both technological and pedagogical knowledge, and vice versa, although these relationships were not statistically significant at the 0.05 alpha level.

Correlation Analysis between the teachers' level of self-efficacy and level of manifestation of the technological and pedagogical knowledge of the Senior High School Teachers

	Technological Knowledge	*Pedagogical Knowledge*
Correlation Coefficient	-.031	*-.047*
p-value	.776	*.671*
Level of Self-Efficacy Decision on H_o	Do not reject H_o	*Do not reject H_o*
Interpretation	*Not significant*	*Not significant*

The researcher's classroom observations and interactions with colleagues have revealed that some teachers proficient in using digital tools—such as presentation software, learning management systems, and educational apps—still express uncertainty in effectively embedding these tools within pedagogically sound teaching methods. This disconnect often arises when technological integration lacks alignment with student-centered strategies, leading to decreased confidence in the overall teaching process despite their technological fluency.

This interpretation aligns with Rasdiana et al. (2023), who emphasized that teachers' professional digital competence is significantly influenced by their attitudes and the leadership environment. In observed school settings, those under supportive school heads with a strong focus on digital literacy tend to exhibit higher engagement with technology. However, even in these contexts, some teachers still struggle with merging technology use with reflective and interactive teaching practices, indicating a gap in pedagogical application.

Furthermore, pedagogical knowledge recorded the lowest mean score among the assessed domains, with many teachers rating themselves lower in this area. This may reflect the observed challenge of translating theoretical pedagogy into practical strategies in daily instruction. Based on the researcher's experience, even experienced teachers occasionally revert to traditional lecture-based approaches, especially when facing time constraints, large class sizes, or limited access to pedagogical resources. While access to technology may be improving, effective training on integrating such tools into active learning, differentiated instruction, or inquiry-based approaches remains limited.

This finding supports the work of Lu et al. (2021), who highlighted that although teachers may possess technical competencies, they often face challenges in aligning those competencies with appropriate pedagogical strategies. Additionally, Mendoza et al. (2024) documented that while many Filipino teachers exhibit skill in employing varied instructional strategies, there remains a significant need to continuously strengthen their pedagogical foundation.

IV. Summary

The study, "Technological and Pedagogical Knowledge of Senior High School Teachers: Basis for a Proposed Enhancement Program," evaluated the technological and pedagogical competencies of Senior High School teachers in the San Francisco District, Agusan del Sur. It investigated the effectiveness of ICT integration, pedagogical approaches, and the relationship between teacher self-efficacy and professional competencies. The findings informed the development of an enhancement program aimed at improving teaching quality and student learning outcomes.

V. Theoretical Framework and Methodology

Grounded in the TPACK framework, the study addressed challenges in ICT integration and pedagogical strategies. Employing a descriptive-correlational design, the research utilized surveys, interviews, and classroom observations to identify gaps in teachers' technological knowledge (TK) and pedagogical knowledge (PK). The study involved 85 SHS teachers from six public schools, selected via cluster sampling, including teachers with at least one year of permanent service and student feedback for objectivity. Data, collected using validated tools, were analyzed to examine relationships between teacher demographics and knowledge levels, providing a basis for targeted professional development.

Significance and Aim

The study's results serve as a foundation for developing enhancement programs designed to bolster educators' skills in delivering high-quality, technology-integrated instruction. By identifying specific areas of need and understanding the factors influencing teachers' technological and pedagogical knowledge, the research aims to contribute to more effective professional development initiatives and ultimately enhance student learning experiences within the district.

VI. Findings

1. The study revealed that the majority of respondents (49 teachers) were early-career professionals holding the position of Teacher I with 0 to 3 years of teaching experience. These teachers were predominantly college graduates, with the largest group specializing in English.

2. The overall level of self-efficacy among the teachers was found to be very high, with a weighted mean of 4.60. Notably, the highest level of self-efficacy was observed in teachers' confidence in their ability to inspire students to believe in their academic capabilities, indicating a strong belief in their capacity to foster student motivation and success.

3. The level of manifestation of Senior High School teachers' knowledge was also categorized as very high, with an overall weighted mean of 3.51 for technological knowledge and 3.56 for pedagogical knowledge, indicating a strong foundation in both areas.

4. Statistical analysis indicated no significant differences in the levels of technological and pedagogical knowledge among senior high school teachers based on various profile variables, including teaching position ($p=.959$), highest educational attainment ($p=.358$), field of specialization ($p=.834$), and years in teaching ($p=.720$). All p-values were above the significance threshold of 0.05, suggesting that these demographic factors did not significantly influence teachers' reported knowledge levels.\

5. Correlation analysis revealed no statistically significant relationship between senior high school teachers' levels of self-efficacy and their levels of technological knowledge ($r=-.031, p=.776$) or pedagogical knowledge ($r=-.047, p=.671$). The correlation coefficients indicated a very weak negative trend, and the p-values were well above the 0.05 significance level, indicating no meaningful linear association between teachers' confidence and their reported knowledge in these areas.

6. Based on the aforementioned findings, the researcher proposed an enhancement program titled: Technology Empowerment and Advancement for Classroom Heroes (Project TEACH), designed to address the identified strengths and areas for potential growth in teachers' technological and pedagogical competencies.

VII. Conclusions

1. Teachers' academic backgrounds and experience levels suggest varied engagement with technology and innovation. Early-career teachers are often more open to new methods, while experienced teachers may need targeted support for technological updates. Advanced degree holders might require guidance to balance research with effective instruction.

2. High teacher self-efficacy, particularly in student motivation and fostering academic belief, is crucial for student outcomes and effective learning environments. However, slightly lower confidence in diverse assessment strategies indicates a need for ongoing professional development in this area.

3. Strong teacher capabilities in using ICT for collaboration and guiding discussions positively impact student engagement and 21st-century skills. However, lower proficiency in self-directed learning and ethical technology use necessitates focused training in these specific areas.

4. The lack of significant relationships between teacher profile variables and technological/pedagogical knowledge suggests these demographics do not inherently enhance competence. This uniformity implies equal training access but potentially stagnant growth, highlighting the need for dynamic and differentiated professional development.

5. The absence of a significant link between self-efficacy and actual technological/pedagogical knowledge indicates that confidence alone does not guarantee effective practice. Even confident teachers may struggle with meaningful technology integration, emphasizing the importance of practical skills development alongside morale boosting.

6. The proposed Project TEACH (Technology Empowerment and Advancement for Classroom Heroes) underscores the urgent need for targeted, hands-on training to address technological and pedagogical knowledge gaps among Senior High School teachers. This initiative aims to improve classroom dynamics, teaching effectiveness, and student engagement in modern education.

Recommendations

1. Schools should implement differentiated professional development programs tailored to teachers' career stages. Early-career educators need continued support for innovative methods, experienced teachers require advanced technology workshops, and those with advanced degrees benefit from balancing research with practical teaching integration. This ensures sustained teacher engagement and effectiveness in student learning.

2. Professional development should enhance teachers' diverse assessment strategies through hands-on workshops and peer learning opportunities for sharing best practices. This will bolster confidence and adaptability in addressing varied student needs with effective and inclusive assessment methods.

3. Educational institutions need specialized training programs addressing gaps in self-directed learning and ethical technology use. Workshops in these areas will equip teachers to support independent learning and responsible technology use. Collaborative learning and peer strategy exchange will further strengthen pedagogy and enhance student engagement in digital environments

4. To address the lack of correlation between teacher profiles and competencies, professional development should be more dynamic and personalized, moving beyond a one-size-fits-all model. Integrating regular feedback and assessment will effectively identify and address individual needs, ensuring continuous instructional growth and improved educational outcomes for all teachers.

5. Enhancement programs for technology integration must prioritize practical skill-building alongside self-efficacy. Hands-on workshops, collaborative planning, and real-world applications are crucial. Sustained mentorship and

support will ensure confidence translates into effective technology and pedagogy implementation, directly benefiting student learning and classroom performance.

6. Implementing the proposed Project TEACH is essential to address specific technological and pedagogical knowledge gaps among Senior High School teachers. This program should offer in-depth training in technology integration for 21st-century learning, digital resource evaluation, and ethical, inclusive teaching. Regular evaluations and adaptive feedback will ensure the program remains responsive to teacher needs, significantly improving teaching effectiveness, classroom interactions, and student achievement.

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