Correlates of Technological, Pedagogical, and Content Knowledge (TPACK): Instructional Competence and Work Engagement of *Teachers*

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ABSTRACT

This study investigated how instructional competence and work engagement are significantly correlated to technological, pedagogical, and content knowledge (TPACK) of the teachers in public elementary schools Teachers in Tiaong 1 District, Division of Quezon. Specifically, this study sought to identify the extent of technological, pedagogical, and content knowledge of teachers, level of instructional competence, and work engagement in teaching and learning. The relationship and predictors of technological, pedagogical, and content knowledge with the instructional competence and work engagement of the teachers were also examined in the study. Further, 98 teachers from eight public elementary schools in Tiaong 1 District were the respondents in this study. Weighted mean, standard deviation, Pearson r moment of correlation, and regression analysis were used as statistical treatments. The result underscored that the importance of all the three components of Technological Pedagogical, and Content Knowledge in enhancing teachers' instructional competence, with content knowledge playing the most influential role, followed by pedagogical and technological knowledge. Moreover, all three components of Technological, Pedagogical, and Content Knowledge are significantly associated with teachers' work engagement, with Content Knowledge as the most influential. Among the predictors, content knowledge had a stronger influence on instructional performance. Technological knowledge also contributed significantly. In terms of work engagement, content knowledge emerged as the strongest predictor, while pedagogical knowledge also had a significant positive impact on it.

Consequently, the following recommendations are provided; The school heads may have a broader understanding of how the teachers practice their TPACK and their work engagement to create a culture of learning throughout the school and adopt or modify different practices; the teachers may determine, develop, and enhance their instructional competence and work engagement to further improve their work performance aligned to the standards set by the department; the future researchers may conduct related studies and satisfy their curiosity about the instructional competence and work engagement practices to enhance the quality of education provided to the learners.

Keywords: technological, pedagogical, content knowledge, work engagement, instructional competence

1. Introduction

"Teachers…are the most responsible and important members of society because their professional efforts affect the fate of the earth". –Caldicott, et al.

Changes are unavoidable in a world that is becoming more turbulent, uncertain, and complex. The explosion of knowledge that gives rise to an increasing number of societal issues confronts and challenges people. The expansion of international ties and globalization change the benchmarks and metrics for education in different nations. Students' awareness and understanding are expanded by the deluge of information that is easily accessible to all age groups due to the widespread use of media technology (Zamora and Zamora, 2022).

In response to the 21st century learning and the introduction of the K–12 Basic Education Curriculum in the Philippines in particular, improvements in teacher quality were pursued, leading to the creation of a framework for teacher quality assessment which is Technological, Pedagogical, and Content Knowledge (TPACK).

Chauhan (2024) stated that the conventional approaches to education are sufficient to improve students' learning abilities. Students can learn by practicing or doing, and techno-pedagogy has the potential to be an instrumental tool that supports their learning. Teachers may be able to engage their students. The implementation of these technical breakthroughs, even if teachers are not conversant with them, is what counts in educational institutions.

The purpose of the study was to find out how the instructional competence of the teachers is significantly affected by the level of technological pedagogical content knowledge they practice and their work engagement that are manifested in school. As future school heads, the teachers in a well-managed school should perform well beyond their work as teachers. This is to find out how these teachers cope, adjust, and go through some challenges

that they are experiencing. These are inability to cope and adjust with the latest TPACK approach on the technological tools and resources, latest instructional strategies, and the learning competencies set for students' holistic development. From these, these also seek if TPACK model may establish on work engagement and instructional competencies in terms of cognitive, emotional, and social engagement and subject knowledge mastery, teaching skills, evaluation skills, and classroom management.

1.1 Statement of the Problem

The study aimed to understand how instructional competence and work engagement are significantly correlated to technological pedagogical content knowledge (TPACK) of the teachers in Public Elementary Schools Teachers in Tiaong 1 District, Division of Quezon.

Specifically, this seeks to answer the following questions:

1. To what extent do teachers manifest their technological pedagogical content knowledge in school in terms of:

    1.1. technological;

    1.2. pedagogical; and

    1.3. content knowledge?

2. What is the level of instructional competence of the teachers in the respondent schools in terms of:

    2.1. subject knowledge mastery;

    2.2. teaching skills;

    2.3. evaluation skills; and

    2.4. classroom management?

3. How is the work engagement of the teachers in teaching and learning perceived in terms of:

    3.1. cognitive;

    3.2. emotional; and

    3.3. social engagement

3.3.1 with students; and

3.3.2 with colleagues?

4. Is there a significant relationship of technological, pedagogical, and content knowledge with the instructional competence and work engagement of the teachers?

5. Does technological, pedagogical, and content knowledge significantly predict instructional competence and work engagement of the teachers?

2. Methodology

The study utilized the descriptive correlational study method. It is a type of study in which information is collected without any modifications to the subject of the study. However, several different types of descriptive correlational methods are employed in research differently. The descriptive research design to be utilized in this investigation is the questionnaire as primary tool for gathering data.

This study investigated the associations of correlations between variables. While the results of correlational studies are not proof of causation, they can assist in distinguishing factors that may be essential in explaining a phenomenon from those that are not. As a result, descriptive research is used frequently to develop hypotheses that may be evaluated using more rigorous techniques.

Particularly, the study determined the correlation of technological pedagogical content knowledge with teachers' instructional competence and work engagement.

The respondents were selected from 8 public elementary schools in Tiaong 1 District, Division of Quezon. There population were 121 and 98 of them were the sample of the study. All of the respondents were selected randomly. The study was conducted where the members of the population had the capability to become part of the sample.

Random sampling technique was applied in this research in which teachers in the District were given equal chances to participate in the study.

Random sampling is the easiest to utilize of all the probability sampling techniques because it only takes one random selection and minimal prior population knowledge. Any research done on this sample should have high internal and external validity and be less susceptible to research biases like selection and sampling bias because it uses randomization (Thomas, 2020).

A researcher-made questionnaire was used in gathering the needed data. It consisted of three parts, namely:

Part I. It pertains to the teachers' techno-pedagogical content knowledge of the teacher respondents as perceived.

Part II. It seeks the teachers' level of instructional competence based on The Philippine Professional Standards for Teachers (PPST) and aligned with Medley's theory of teacher competence in terms of mastery of the subject matter, teaching skills, evaluation skills, and classroom management.

Part III. It focuses on the perception of work engagement of the teachers, such as cognitive engagement, emotional engagement, and social engagement with students and colleagues. The survey questionnaire was subjected to comments and suggestions of the Panel of Examiners to confirm that it would obtain relevant data purposely for the present study.

The survey questionnaire was likewise validated by school personalities in the researcher's workplace. They examined the instrument for clarity and appropriateness of responses listed, application theories into practices, relationship of the indicative to the research problem, and construct measure. The validation instrument used the scale: 5-Very High Extent; 4- Very High Extent; 3- Moderate Extent; 2-Less Extent; 1-No Extent. To guarantee its consistency and correctness, the instrument was subjected to measure the internal consistency which employed the Cronbach's Alpha basic concept of Reliability Coefficient.

The researcher sought permission from the Office of the Schools District Supervisor through a formal request to distribute and retrieve questionnaire from the teacher respondents. The letter of recommendation was duly signed and approved by the authorities before the administration of the research instrument. Following the receipt of approval, the researcher proceeded to communicate with the teachers who were identified as potential respondents.

The questionnaire were then distributed to the respondents through online platforms practically Google form. This approach chosen to avoid the risk of data tampering and ensure possible retrieval of responses. The study's purpose was enclosed in the questionnaire, with the assurance that the teachers' responses were treated with anonymity and confidentiality. The information reflected in the questionnaire would be treated with anonymity and confidentiality. The information gathered were carefully recorded, tabulated, analyzed and interpreted using appropriate statistical tests.

With the analysis and interpretation of data, simple descriptive statistics such as mean, standard deviation, frequency count, and percent distribution were calculated. Mean is the average of all numbers in a given set of data, whereas Standard Deviation (SD) is the extent of the spread of numbers in a group of data from its mean value; this may also be referred to as a measure of variability or volatility in the given collection of data. Pearson Product-Moment Correlation Coefficient was employed to measure the relationship of TPACK with instructional competence and work engagement. It builds a line of best fit over the data of two variables, where Pearson correlation coefficient, r, indicates how distant these data points are from this line of most excellent fit.

Moreover, regression analysis was utilized to determine the strength of the relationship of TPACK with instructional competence and work engagement and to predict and model the future relationship between them.

3. Results and Discussion

Table 3. Extent of Teacher's Technological, Pedagogical, and Content Knowledge as to Technological Knowledge

As a teacher, I am able to…	Mean	SD	VI
1. utilize AI assisted tools, such as Quillbot, and ChatGPT to help me create necessary documents.	4.10	0.87	HE
2. download and upload files from the Internet and can attach files to an e-mail.	4.56	0.63	VHE
3. use social networking sites, such as Facebook as a back-up instructions, learning materials, etc.	4.55	0.63	VHE
4. practice the proper netiquettes (i.e.security issues, data privacy, etc.) while using technology in teaching	4.62	0.53	VHE
5. maximize the use of online storage devices such as Google drives and iCloud.	4.47	0.63	HE
Overall	**4.29**	**0.63**	**High Extent**

Legend:

4.50 – 5.00	Very High Extent (VHE)	1.50 – 2.49	Less Extent (LE)
3.50 – 4.49	High Extent (HE)	1.00 – 1.49	No Extent (NE)
2.50 – 3.49	Moderate Extent (ME)		

In Table 3 statement 4 "*practice the proper netiquettes (i.e.security issues, data privacy, etc.) while using technology in teaching.*" earned the highest mean of 4.62, interpreted as "very high extent." This denotes that the respondents teachers must practice proper netiquette, including attention to security and data privacy, to protect sensitive student information and maintain a safe online learning environment. By modeling responsible digital behavior,

teachers help students develop respectful and safe internet habits. Additionally, adhering to ethical and legal standards ensures that the use of technology in education remains effective, secure, and trustworthy.

On the contrary, statement 1 "*utilize AI assisted tools, such as Quillbot, and ChatGPT to help me create necessary documents.*" received the lowest mean of 4.10, interpreted as "high extent," this indicated that some the respondents were not quite familiar with the AI tools such as Quillbot, and ChatGPT. Despite its low mean score among the statements, it saves their time by quickly generating lesson plans, worksheets, and assessments while improving writing clarity and structure. These tools also support personalized learning, automate administrative tasks, and enhance engagement with creative content.

Furthermore, the overall mean of 4.29 attained by the respondents' perception on the extent of teacher's technological pedagogical content knowledge as to technological knowledge, interpreted as "high extent," proves that the respondents are in unison with regards to the importance of technological knowledge among teachers as it enhances their ability to create engaging, interactive lessons and adapt to modern teaching methods. It allows them to use digital tools for lesson planning, assessments, and communication, improving both teaching effectiveness and student learning outcomes. Additionally, staying updated with technology helps teachers prepare students for a digital-driven future.

Table 4. Extent of Teacher's Technological, Pedagogical, and Content Knowledge as to Pedagogical Knowledge

As a teacher, I am able to …	*Mean*	*SD*	*Verbal Interpretation*
1. present the lesson using the different applications and software like SlidesGo, and the likes.	*4.10*	*0.81*	*HE*
2. suggest different mobile applications like WordWall, Quizziz, etc. as instructional materials and resources.	*4.06*	*0.85*	*HE*
3. create collaborative group activities to encourage participation and shared leadership.	*4.52*	*0.60*	*VHE*
4. promote manipulative models and simulation in the lesson for learners to experiment on new ideas.	*4.42*	*0.67*	*HE*
5. engage the learners through interactive instructional strategies appropriate to their level and learning styles.	*4.39*	*0.67*	*HE*
Overall	*4.24*	*0.66*	*High Extent*

Legend:

4.50 – 5.00	*Very High Extent (VHE)*	*1.50 – 2.49*	*Less Extent (LE)*
3.50 – 4.49	*High Extent (HE)*	*1.00 – 1.49*	*No Extent (NE)*
2.50 – 3.49	*Moderate Extent (ME)*		

Table 4 depicts that the respondents perceived the extent of TPACK as to pedagogical knowledge statement 3 "*create collaborative group activities to encourage participation and shared leadership.*" with the highest mean of 4.52 interpreted as "very high extent". Creating collaborative group activities encourages student engagement, fosters teamwork, and develops essential communication skills. It also allows teachers to promote shared leadership, helping students take responsibility for their learning while enhancing critical thinking and problem-solving abilities.

On the other hand, the respondents perceived statement 2, which "*suggest different mobile applications like WordWall, Quizziz, etc. as instructional materials and resources".* The lowest mean of 4.06 was inferred as high extent. Recommending mobile applications like WordWall and Quizizz provides teachers with interactive and engaging instructional tools that enhance student learning. These apps support diverse teaching strategies, making lessons more dynamic, personalized, and effective in reinforcing key concepts.

Collectively, statements are foreseen by the respondents as "high extent" with an overall mean of 4.24. Pedagogical knowledge is essential for teachers as it equips them with effective teaching strategies, classroom management skills, and assessment techniques to enhance student learning. It enables them to adapt instruction to different learning styles, ensuring that all students can grasp and apply concepts effectively. A strong foundation in pedagogy also fosters a more engaging and supportive learning environment, leading to better academic outcomes.

Table 5 on the succeeding page reflects the extent of TPACK as to content knowledge. It was revealed on the table that statement 2, "*identify the learning competency and desired learning outcome for a lesson,*" as assessed by the respondents with the highest mean of 4.58, interpreted as a very high extent. The respondents agreed that the identification of learning competencies and desired learning outcomes is crucial for teachers as it provides a clear roadmap for lesson planning and instruction. It ensures that lessons are aligned with curriculum standards, helping students achieve specific skills and knowledge effectively.

Table 5. Extent of Teacher's Technological, Pedagogical, and Content Knowledge as to Content Knowledge

As a teacher, I am able to …	Mean	SD	Verbal Interpretation
1. share examples and situations aligned with the module.	4.50	0.60	VHE
2. identify the learning competency and desired learning outcome for a lesson.	4.58	0.57	VHE
3. integrate new and old learnings to develop a new understanding.	4.49	0.61	HE
4. assimilate and refine my knowledge, skills, and attitude/values by assessing and processing the ideas or contexts related to the subject.	4.48	0.60	HE
5. expound previous experiences and core knowledge in understanding the purpose of the lesson, from the core content, and relevant samples.	4.52	0.60	VHE
Overall	**4.51**	**0.55**	**Very High Extent**

Legend

4.50 – 5.00	Very High Extent (VHE)	1.50 – 2.49	Less Extent (LE)
3.50 – 4.49	High Extent (HE)	1.00 – 1.49	No Extent (NE)
2.50 – 3.49	Moderate Extent (ME)		

The respondents assessed statement 4, "*assimilate and refine my knowledge, skills, and attitude/values by assessing and processing the ideas or contexts related to the subject*" with the lowest mean of 4.48, and interpreted as high extent. It implies that teachers are allowed to continuously improve their teaching effectiveness and adapt to evolving educational demands. By assessing and processing ideas related to their subject, teachers enhance their expertise, making lessons more relevant, engaging, and impactful for students. This reflective practice also fosters professional growth, encouraging lifelong learning and a deeper commitment to quality education. Generally, the respondents see the teacher's technological, pedagogical, and content knowledge as to content knowledge with "very high extent," with an overall mean of 4.51. This signifies the respondents give that content knowledge high regard. Teachers need content knowledge because it guarantees that they have a thorough comprehension of what they teach, enabling them to accurately and clearly convey concepts. It gives them the confidence to respond to student inquiries, relate subjects to practical uses, and provide engaging educational opportunities. Strong content knowledge also aids educators in creating courses that are well-structured and encourage students to think critically and comprehend concepts more deeply.

Level of Teacher's Instructional Competence

Presented in Table 6 is the level of teachers' instructional competence as to subject knowledge mastery. Statement 1 "*apply knowledge of content within and across curriculum teaching areas*" attained a mean of 4.60 and was construed as very high level by the respondents. This implies that the respondents are well aware that teachers can combine many disciplines and make learning more coherent and relevant for students by using their understanding of content both inside and beyond curriculum areas. Demonstrating the connections between ideas across disciplines, it fosters the growth of critical thinking, problem-solving, and creativity. Additionally, this multidisciplinary approach improves student engagement and equips them to tackle real-world problems that call for expertise in a variety of subjects.

Table 6. Level of Teachers' Instructional Competence as to Subject Knowledge Mastery

As a teacher, I am able to…	Mean	SD	Verbal Interpretation
1. apply knowledge of content within and across curriculum teaching areas.	4.60	0.55	VHE
2. use research-based knowledge and principles of teaching and learning to enhance professional practice.	4.32	0.65	HE
3. ensure the positive use of ICT to facilitate the teaching and learning process.	4.56	0.58	VHE
4. use a range of teaching strategies that enhance learner achievement in literacy and numeracy skills.	4.51	0.58	VHE
5. apply a range of teaching strategies to develop critical and creative thinking, as well as other higher-order thinking skills.	4.46	0.58	HE
6. display proficient use of mother tongue, Filipino and English to facilitate teaching and learning.	4.57	0.54	VHE
7. use effective verbal and non-verbal classroom communication strategies to support learner understanding, participation, engagement and achievement.	4.56	0.54	VHE

	Mean	SD	VI
8. can use social networking sites, such as Facebook as a back-up instructions, learning materials, etc.	4.49	0.60	HE
Overall	**4.55**	**0.51**	**Very High Level**

Legend:

4.50 – 5.00	Very High Extent (VHE)	1.50 – 2.49	Less Extent (LE)
3.50 – 4.49	High Extent (HE)	1.00 – 1.49	No Extent (NE)
2.50 – 3.49	Moderate Extent (ME)		

Statement 2, "*use research-based knowledge and principles of teaching and learning to enhance professional practice*", received the lowest mean of 4.32, interpreted as high level. Even with the low mean score among the other indicators, the results still signify that Using research-based knowledge and principles of teaching and learning helps teachers make informed decisions that improve student outcomes and classroom effectiveness. It allows them to apply proven strategies tailored to diverse learning needs, promoting deeper understanding and engagement. This continual application of evidence-based practices also supports professional growth and ensures teaching remains current, relevant, and impactful.

Respondents perceived the level of teachers' instructional competence as to subject knowledge mastery with a very high level (4.55), signifying that the practice of subject knowledge mastery allows teachers to explain concepts clearly, adapt lessons to different learning styles, and address misconceptions effectively. It enhances their confidence and credibility, enabling them to engage students and foster critical thinking. Additionally, it helps teachers design meaningful assessments and provide constructive feedback, ultimately improving student learning outcomes.

As seen in Table 7, the level of teachers' instructional competence as to teaching skills assessed statement 1, which "*make sure that the objectives are specific, measurable, attainable, realistic and time-bound.*" with the highest mean of 4.60 interpreted as a very high level. The figure suggests that the respondents ensure that objectives are specific, measurable, attainable, realistic, and time-bound (SMART) to provide clear learning goals and track student progress effectively. Well-defined objectives help in structuring lessons, assessing student understanding, and making necessary adjustments to improve learning outcomes. By setting SMART objectives, teachers create a focused and achievable roadmap that enhances both instruction and student success.

Table 7. Level of Teachers' Instructional Competence as to Teaching Skills

As a teacher, I am able to…	Mean	SD	VI
1. make sure that the objectives are specific, measurable, attainable, realistic and time-bound.	4.60	0.51	VHL
2. plan, manage and implement developmentally sequenced teaching and learning process to meet curriculum requirements and varied teaching contexts.	4.52	0.52	VHL
3. ensure that the materials to be used are aligned with the lesson objectives, activities, and assessments.	4.52	0.56	VHL
4. set achievable and appropriate learning outcomes that are aligned with learning competencies.	4.52	0.56	VHL
5. adapt and implement learning programs that ensure relevance and responsiveness to the needs of all learners.	4.52	0.54	VHL
6. participate in collegial discussions that use teacher and learner feedback to enrich teaching practice.	4.43	0.56	HL
7. develop assignments that encourage critical thinking in my students.	4.56	0.54	VHL
8. select, organize, and use appropriate teaching and learning resources, including ICT, to address learning goals.	4.56	0.52	VHL
Overall	**4.58**	**0.47**	**Very High Level**

Legend:

4.50 – 5.00	Very High Level (VHL)	1.50 – 2.49	Low Level (LL)
3.50 – 4.49	High Level (HL)	1.00 – 1.49	Very Low Level (VLL)
2.50 – 3.49	Moderate Level (ML)		

Respondents assessed statement 6, "*participate in collegial discussions that use teacher and learner feedback to enrich teaching practice.*" with the mean of 4.43 being the lowest amongst the other indicators interpreted as high level. Even though it ranked the lowest, this shows that the respondents participate in collegial discussions using teacher and learner feedback to improve their teaching strategies and address students' needs effectively. These discussions foster collaboration, allowing educators to share best practices, reflect on challenges, and implement innovative solutions. By engaging in professional dialogue, teachers enhance their instructional methods, ultimately leading to better student learning outcomes.

Overall, the respondents asserted a "very high level" on the perceived level of teachers' instructional competence as to teaching skills with an overall mean of 4.58. The result denotes that the respondents consider instructional competence as an essential skill for delivering clear, engaging, and effective lessons that cater to diverse student needs. Strong teaching skills enable educators to use various instructional strategies, manage classrooms efficiently, and adapt to different learning styles. With high instructional competence, teachers can foster critical thinking, encourage active participation, and ultimately improve student achievement.

Table 8 manifests the level of teachers' instructional competence as to evaluation skills; statement number 2 "*monitor and evaluate learner progress and achievement using learner attainment data,*" with the highest mean of 4.63 interpreted as a very high level among the others. This implies that monitoring and evaluating learner progress using attainment data enables teachers to identify strengths, address learning gaps, and adjust instruction to meet individual needs. It supports data-driven decision-making, ensuring that teaching strategies are effective and aligned with learning goals.

Table 8. Level of Teachers' Instructional Competence as to Evaluation Skills

As a teacher, I am able to…	Mean	SD	Verbal Interpretation
1. design, select, organize and use diagnostic, formative and summative assessment strategies consistent with curriculum requirements.	4.58	0.55	VHL
2. monitor and evaluate learner progress and achievement using learner attainment data.	4.63	0.53	VHL
3. consider the individual differences of learners in the assessment and evaluation.	4.54	0.56	VHL
4. use strategies for providing timely, accurate and constructive feedback to improve learner performance.	4.49	0.58	HL
5. select problems that are applicable to real-life situations and let the learners find a solution.	4.53	0.56	VHL
6. communicate promptly and clearly the learners' needs, progress and achievement to key stakeholders, including parents/guardians.	4.56	0.54	VHL
7. utilize assessment data to inform the modification of teaching and learning practices and programs.	4.49	0.60	HL
8. focus on project-based learning which enables learners to put knowledge together.	4.45	0.59	HL
Overall	**4.52**	**0.49**	**Very High Level**

Legend:

4.50 – 5.00	*Very High Level*	*(VHL)*	1.50 – 2.49	*Low Level (LL)*	
3.50 – 4.49	*High Level (HL)*		1.00 – 1.49	*Very Low Level (VLL)*	
2.50 – 3.49	*Moderate Level (ML)*				

Unlike the other statements, at a very high level, the respondents perceived statement 8 "*focus on project-based learning which enables learners to put knowledge together",* with the lowest mean of 4.45 interpreted as high level. The result signifies that the respondents recognize that project-based learning encourages learners to apply their knowledge in real-world contexts, fostering deeper understanding and critical thinking. By integrating different subjects and skills, it helps students make meaningful connections between concepts, enhancing retention and problem-solving abilities. This hands-on approach also promotes collaboration, creativity, and independent learning, preparing students for future academic and professional challenges.

Overall, the level of teachers' instructional competence as to evaluation skills gained the overall mean perception of 4.52, interpreted as "very high level" The results denoted that teachers' instructional competence in evaluation skills is crucial for accurately assessing student learning and adjusting teaching strategies to meet diverse needs. Effective evaluation ensures that assessments are fair, reliable, and aligned with learning objectives, providing valuable insights into student progress. Strong evaluation skills also help teachers give constructive feedback, guiding students toward improvement and academic success.

Table 9 reflects the level of teachers' instructional competence in classroom management. As shown, it revealed that statement 2 "*maintain learning environments that promote fairness, respect and care to encourage learning,*" attained the highest mean of 4.68, interpreted as "very high level." This implies that maintaining a learning environment that promotes fairness, respect, and care fosters a sense of safety and belonging, which is essential for student engagement and motivation. When students feel valued and treated equitably, they are more likely to participate actively and take ownership of

their learning. Such an environment also supports positive relationships and reduces behavioral issues, creating a foundation for meaningful and effective learning.

Table 9. Level of Teachers' Instructional Competence as to Classroom Management

As a teacher, I am able to…	Mean	SD	Verbal Interpretation
1. establish safe and secure learning environments to enhance learning through the consistent implementation of policies, guidelines and procedures.	4.60	0.57	VHL
2. maintain learning environments that promote fairness, respect and care to encourage learning.	4.68	0.53	VHL
3. manage classroom structure to engage learners, individually or in groups, in meaningful exploration, discovery and hands-on activities within a range of physical learning environments.	4.62	0.55	VHL
4. maintain supportive learning environments that nurture and inspire learners to participate, cooperate and collaborate in continued learning.	4.64	0.54	VHL
5. create a motivation that enhances the interest of the learners towards the lesson	4.60	0.55	VHL
6. relate the subject matter with relevant and current social issues or trends	4.57	0.54	VHL
7. apply a range of successful strategies that maintain learning environments that motivate learners to work productively by assuming responsibility for their own learning.	4.56	0.54	VHL
8. manage learner behavior constructively by applying positive and non-violent discipline to ensure learning-focused environments.	4.59	0.53	VHL
Overall	**4.60**	**0.50**	**Very High Level**

Legend:

4.50 – 5.00	Very High Level (VHL)	1.50 – 2.49	Low Level (LL)
3.50 – 4.49	High Level (HL)	1.00 – 1.49	Very Low Level (VLL)
2.50 – 3.49	Moderate Level (ML)		

The lowest mean amongst the statements with 4.56; the respondents interpreted indicator 7, "*apply a range of successful strategies that maintain learning environments that motivate learners to work productively by assuming responsibility for their own learning*" as very high level. The result means that applying a range of effective strategies helps teachers create a dynamic and engaging learning environment that encourages students to take ownership of their learning. Students develop self-discipline and problem-solving skills when motivated and given responsibility.

Generally, the perceived level of teachers' instructional competence as to classroom management is "very high level," with an overall mean of 4.60, which signifies that the teachers' instructional competence in classroom management is essential for creating a structured and positive learning environment where students can focus and thrive. Effective classroom management minimizes disruptions, promotes student engagement, and ensures that learning time is maximized.

Teacher's Work Engagement in Teaching and Learning

Table 10 shows the teachers' work engagement in teaching and learning as to cognitive engagement. It is revealed that statement 5 "*participate in Learning Action Cells or any collaborative sharing*" obtained the highest mean of 4.64 inferred as "very high extent," which implies that participating in Learning Action Cells or other collaborative sharing activities allows teachers to exchange ideas, strategies, and best practices, enhancing their teaching effectiveness. It fosters a supportive professional community where teachers can reflect on challenges and grow together.

Table 10. Teacher's Work Engagement in Teaching and Learning as to Cognitive Engagement

I am able to...	Mean	SD	VI
1. try my best to perform well while teaching.	4.57	0.54	VHE
2. put my best effort into every aspect of instructional activities	4.50	0.58	VHE
3. pay attention to every detail of what I do.	4.52	0.56	VHE
4. prepare my teaching and learning deliverables with utmost intensity.	4.42	0.55	HE
5. participate in Learning Action Cells or any collaborative sharing.	4.64	0.50	VHE

	Mean	SD	VI
6. encourage others to craft research studies and join conferences.	4.16	0.68	HE
7. share my best practices with my colleagues to enhance the teaching and learning experiences.	4.34	0.72	HE
Overall	**4.45**	**0.55**	**High Extent**

Legend:

4.50 – 5.00	Very High Extent (VHE)	1.50 – 2.49	Less Extent (LE)
3.50 – 4.49	High Extent (HE)	1.00 – 1.49	No Extent (NE)
2.50 – 3.49	Moderate Extent (ME)		

The respondents perceived statement 6, which "*encourage others to craft research studies and join conference*" the lowest mean of 4.16 among all indicators which was construed as "high extent." This signifies that the respondents believe that they play a vital role in inspiring others to engage in research and participate in conferences, fostering a culture of curiosity, critical thinking, and continuous learning.

Overall, the teacher's work engagement in teaching and learning as to cognitive engagement was asserted as "high extent" with an overall mean level of 4.45 by expressing that A teacher's work engagement in teaching and learning is essential to fostering students' cognitive engagement, as it directly influences the energy, enthusiasm, and instructional quality brought into the classroom. When deeply invested, teachers create dynamic learning environments that stimulate students' thinking, curiosity, and active participation in the learning process.

Table 11. Teacher's Work Engagement in Teaching and Learning as to Emotional Engagement

I am able to...	Mean	SD	VI
1. come to school and share new knowledge with the class with excitement.	4.51	0.61	VHE
2. feel happy with my learners' achievement.	4.72	0.51	VHE
3. experience sadness when my learners are disheartened.	4.54	0.56	VHE
4. find the teaching and learning process fun and adventurous.	4.52	0.60	VHE
5. empathize with my colleagues down time.	4.50	0.61	VHE
6. feel proud when my colleagues excel in their own fields.	4.66	0.54	VHE
7. can relate and adapt with any given circumstance in the school community.	4.58	0.55	VHE
Overall	**4.55**	**0.54**	**Very High Extent**

Legend:

4.50 – 5.00	Very High Extent (VHE)	1.50 – 2.49	Less Extent (LE)
3.50 – 4.49	High Extent (HE)	1.00 – 1.49	No Extent (NE)
2.50 – 3.49	Moderate Extent (ME)		

Table 11 yielded statement 2 "*feel happy with my learners' achievement*" which earned the highest mean of 4.72, interpreted as "very high extent." This implication denotes that the respondents positively agree that it is important for teachers to feel happy with their learners' achievements because it reflects a teacher's genuine commitment to student growth and success. It strengthens the teacher-student relationship, motivating learners to continue striving for excellence. This positive emotional connection also reinforces the teacher's sense of purpose and fulfillment in their professional role.

Statement 5 "*empathize with my colleagues down time*" received the lowest mean of 4.50, interpreted as "very high extent," connotes that despite its low mean score among the indicators, teachers need to empathize with colleagues during their down time fosters a supportive and compassionate work environment where everyone feels valued and understood. It helps build strong, trusting relationships that contribute to better teamwork and collaboration. By showing empathy, teachers create a culture of care and mutual respect, which can boost morale and resilience during challenging times.

The overall mean of 4.55 attained by the respondents' perception on teacher's work engagement in teaching and learning as to emotional engagement, interpreted as "very high extent," proves that the respondents are in unison with regards to the perceived teacher's work engagement in teaching and learning is crucial to students' emotional engagement because it directly influences their passion, enthusiasm, and commitment to student success. When teachers are emotionally invested, they create a more dynamic, inspiring, and supportive learning environment. This engagement helps build strong connections with students, fostering trust and motivation in the classroom. Emotionally engaged teachers are also more resilient and reflective, continuously striving to improve their practice and respond to learners' needs with empathy and care.

Table 12. Teacher's Work Engagement in Teaching and Learning as to Social Engagement with Students

I am able to...	Mean	SD	VI
1. show warmth to my learners in class.	4.57	0.52	VHE
2. become aware and sensitive to my learners' feelings.	4.59	0.51	VHE
3. express sincere concern about the problems of my learners.	4.60	0.55	VHE
4. feel empathy toward my students.	4.60	0.53	VHE
Overall	4.59	0.48	Very High Extent

Legend:

4.50 – 5.00	Very High Extent (VHE)	1.50 – 2.49	Less Extent (LE)
3.50 – 4.49	High Extent (HE)	1.00 – 1.49	No Extent (NE)
2.50 – 3.49	Moderate Extent (ME)		

Table 12 depicts that the respondents perceived those statements 3 and 4 "*express sincere concern about the problems of my learners*" and "*feel empathy toward my students*" respectively are tied with the highest mean of 4.60, interpreted as "very high extent". Teachers need to express sincere concern and empathy toward their learners' problems, as it helps build trust, emotional safety, and a strong teacher-student connection. When students feel understood and supported, they are more likely to engage positively in learning and overcome personal or academic challenges. This compassionate approach fosters a nurturing environment where every learner feels valued and motivated to succeed.

On the other hand, the respondents perceived statement 1, which "*show warmth to my learners in class*" with the lowest mean of 4.50 was inferred as very high extent. Teachers need to show warmth to their learners in class because it creates a welcoming and supportive atmosphere where students feel safe, respected, and motivated to participate. Warmth from a teacher encourages positive relationships, boosts learners' confidence, and enhances both emotional and academic engagement.

Collectively, statements are foreseen by the respondents as "very high extent" with an overall mean of 4.59. Perceived teacher's work engagement in teaching and learning promotes students' social engagement by fostering a positive, interactive classroom atmosphere. When teachers are enthusiastic and dedicated, students feel more encouraged to collaborate, communicate, and build meaningful connections with others.

Table 13. Teacher's Work Engagement in Teaching and Learning as to Social Engagement with Colleagues

I am able to...	Mean	SD	VI
1. establish an open connection with my colleagues.	4.51	0.61	VHE
2. commit myself in helping my colleagues if necessary.	4.55	0.59	VHE
3. value the relationships that I have built with my colleagues.	4.61	0.57	VHE
4. show genuine care and concern about the problems of my colleagues.	4.58	0.57	VHE
Overall	4.55	0.57	Very High Extent

Legend:

4.50 – 5.00	Very High Extent (VHE)	1.50 – 2.49	Less Extent (LE)
3.50 – 4.49	High Extent (HE)	1.00 – 1.49	No Extent (NE)
2.50 – 3.49	Moderate Extent (ME)		

Presented in Table 13, the teacher's work engagement in teaching and learning as to social engagement with colleagues assessed statement 3, which "*value the relationships that I have built with my colleagues*" with the highest mean of 4.61 interpreted as very high extent. The figure suggests that the respondents recognize the importance of valuing the relationships they have built with their colleagues, as these connections foster collaboration, mutual support, and a positive work environment. Strong professional relationships enhance teamwork, improve communication, and contribute to a more effective and fulfilling teaching experience.

However, respondents assessed statement 1, "*establish an open connection with my colleagues.*" with the mean of 4.51 being the lowest amongst the other indicators interpreted as very high extent. Even though it ranked the lowest, this shows that the respondents consider open communication as an integral part to enrich their relationship among colleagues. Teachers need to establish an open connection with their colleagues to promote collaboration,

trust, and the free exchange of ideas. This openness strengthens teamwork, supports professional growth, and contributes to a more cohesive and supportive school community.

Overall, the respondents asserted "very high extent" the teacher's work engagement in teaching and learning as to social engagement with colleagues with an overall mean of 4.55. The result denotes that the teachers' work engagement in teaching and learning positively influences social engagement with colleagues by fostering a collaborative and energized work environment. When teachers are passionate and committed, it encourages open communication, mutual support, and shared professional goals, strengthening the overall team dynamic and school culture.

Relationship between the Teachers' Technological Pedagogical Content Knowledge and Instructional Competence

Table 14. Correlation between the Perceived Teachers' Technological Pedagogical Content Knowledge and Instructional Competence

Variables	Teachers' Instructional Competence				
	Subject Knowledge Mastery		Teaching Skills	Evaluation Skills	Classroom Management
• Technological Knowledge	.503**		.354**	.265**	.261**
• Pedagogical Knowledge	.357**		.407**	.264**	.324**
• Content Knowledge	.633**		.644**	.425**	.538**

**Correlation is significant at the 0.01 level (2-tailed)

Based on the findings in Table 14, the results of the correlation test between the perceived teachers' Technological, Pedagogical, and Content Knowledge (TPACK) and their instructional competence reveal statistically significant and positive relationships across all domains. Among the components, Content Knowledge showed the highest correlation, especially with Teaching Skills (r = .644) and Subject Knowledge Mastery (r = .633), suggesting that teachers with strong subject matter expertise tend to exhibit greater competence in instructional delivery. Subject knowledge mastery stands out as a crucial component of instructional competence. Teachers need to be well-versed in the material they teach in order to provide lessons that are clear, concise, and engaging. This is strongly supported by the study of Boholano (2017), who emphasized that teachers' mastery of subject content is foundational to effective teaching, as it allows them to present complex concepts in more meaningful and engaging ways. Likewise, Yigit and Bagceci (2020) confirmed that deep content understanding directly enhances teaching performance and classroom effectiveness.

While the Technological Knowledge displayed a moderate positive correlation with Subject Knowledge Mastery (r = .503) and lower but still significant relationships with Teaching Skills (r = .354), Evaluation Skills (r = .265), and Classroom Management (r = .261). These results imply that while technological proficiency supports content delivery and innovation in instruction, it may have a more limited influence on classroom management and assessment practices. This is consistent with the findings of Koh, Chai, and Tay (2017), who found that while teachers may possess strong technological knowledge, their ability to translate it effectively into classroom practice often depends on how well it is integrated with pedagogical strategies. Similarly, Bower et al. (2017) highlighted that technology use alone does not guarantee instructional effectiveness unless accompanied by appropriate teaching approaches.

Pedagogical Knowledge, on the other hand, was most strongly correlated with Teaching Skills (r = .407) and Classroom Management (r = .324), indicating its vital role in creating structured, engaging, and well-managed learning environments. These findings align with the conclusions of Sari et al. (2020), who emphasized that pedagogical understanding equips teachers with the strategies necessary to manage diverse learners and maintain classroom order. Furthermore, Fathi and Derakhshan (2019) noted that pedagogical knowledge enhances a teacher's ability to connect with students and apply differentiated instructional methods, thereby improving the overall teaching-learning process.

In summary, the results underscore the importance of all three components of TPACK in enhancing teachers' instructional competence, with content knowledge playing the most influential role, followed by pedagogical and technological knowledge. These findings support recent literature that advocates for a holistic development of teachers' knowledge domains to meet the demands of 21st-century education.

Table 15. Correlation between the Perceived Teachers' Technological Pedagogical Content Knowledge and Work Engagement

Variables	Teachers' Work Engagement			
	Cognitive Engagement	Emotional Engagement	Social Engagement with Students	Social Engagement with Colleagues
• Technological Knowledge	.251*	.329**	.357**	.320**
• Pedagogical Knowledge	.292**	.449**	.369**	.447**

• Content Knowledge	.484**	.498**	.482**	.474**

**Correlation is significant at the 0.01 level (2-tailed)

The correlation analysis between perceived teachers' Technological Pedagogical Content Knowledge (TPACK) and their work engagement reveals statistically significant positive relationship across all dimensions of engagement: cognitive, emotional, and social (with both students and colleagues). Among the three components of TPACK, Content Knowledge exhibited the strongest correlation across all areas of work engagement, particularly with Emotional Engagement (r = .498) and Cognitive Engagement (r = .484). This suggests that a teacher's mastery of subject matter fosters deeper intellectual investment and emotional connection to their work. These findings are supported by Yigit and Bagceci (2020), who emphasized that strong content knowledge enhances a teacher's sense of competence and job satisfaction, both of which are critical factors of work engagement.

Pedagogical Knowledge also demonstrated moderate to strong correlation, most notably with Emotional Engagement (r = .449) and Social Engagement with Colleagues (r = .447). This indicates that teachers who possess sound pedagogical strategies are more emotionally connected to their teaching and more likely to engage meaningfully with their peers. The study by Sari et al. (2020) supports this, highlighting how pedagogical proficiency leads to improved classroom practices and fosters collaborative school cultures. Furthermore, Fathi, Derakhshan, and Torabi (2020) found that pedagogical self-efficacy significantly predicts teacher engagement and well-being, reinforcing the relevance of pedagogical knowledge in sustaining emotional and social aspects of professional life.

Moreover, Technological Knowledge, while showing the weakest correlation among the three TPACK components, still revealed statistically significant positive relationship, particularly with Social Engagement with Students (r = .357) and Emotional Engagement (r = .329). This reflects the growing importance of integrating technology into teaching in ways that not only support instructional delivery but also enhance relational and affective dimensions of the learning environment. Koh, et al. (2017) emphasized that when teachers are confident in using technology, they are more likely to design engaging, student-centered activities that promote active participation.

However, the relatively lower correlation of Technological Knowledge with Cognitive Engagement (r = .251) may suggest that technology alone is not sufficient to stimulate deep intellectual engagement without being well-integrated with content and pedagogy, as noted by Chai, et al. (2019).

Overall, the findings underscore that all three components of TPACK are significantly associated with teachers' work engagement, with Content Knowledge being the most influential. These results affirm the importance of a balanced and integrated approach to teacher development, focusing not only on technical skills but also on deep pedagogical and content expertise to sustain meaningful and holistic professional engagement.

Regression Analysis of the Instructional Competence and Work Engagement on Technological, Pedagogical, and Content Knowledge (TPACK) of Teachers

Table 16. Regression of Instructional Competence on TPACK

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.966	0.290		6.771	0.000
C. Content Knowledge	0.446	0.061	0.586	7.355	0.000
A. Technological Knowledge	0.135	0.053	0.204	2.564	0.012

R = .684, Rsquared = .468, F(2,95) = 41.845, p < .001

Table 16 displays the regression analysis that aimed to determine the extent to which instructional performance can be predicted by components of the Technological, Pedagogical, and Content Knowledge framework, specifically content knowledge and technological knowledge. The model yielded a statistically significant result, $F(2, 95) = 41.845$, $p < .001$, indicating that the regression model reliably predicts instructional performance. The r-squared value of 0.468 suggests that approximately 46.8% of the variance in instructional performance can be explained by the combined effects of content knowledge and technological knowledge.

Among the predictors, content knowledge had a stronger influence on instructional competence (B = 0.446, β = 0.586, p < .001), implying that teachers with deeper mastery of subject matter are more likely to demonstrate effective instructional practices. This finding is consistent with the study by Mishra and Koehler (2016), who emphasized that robust content knowledge forms the foundation for meaningful pedagogical and technological integration. Likewise, Valtonen, et al. (2017) supported the importance of Content Knowledge in shaping teachers' instructional quality and ability to adapt instruction to diverse learning contexts.

Technological knowledge also contributed significantly to instructional competence (B = 0.135, β = 0.204, p = .012), although to a lesser value than Content Knowledge. This suggests that while familiarity with digital tools is beneficial, it may not be as critical as content mastery in predicting

instructional success. This finding aligns with the results of Chai, et al. (2019), who noted that while Technological Knowledge enhances teaching practices, its effectiveness is maximized only when combined with strong pedagogical and content foundations.

However, some recent studies, such as those by Schmid et al. (2021), argue that in the digital age, Technological Knowledge may play an increasingly pivotal role in shaping instructional practices, especially in blended or remote learning environments.

Collectively, the findings underscore the importance of maintaining a strong balance between technological skills and content expertise, as both are essential components of the TPACK framework that collectively enhance instructional competence.

Table 17. Regression of Work Engagement based on Technological, Pedagogical, and Content Knowledge of Teachers

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	**Std. Error**	**Beta**		
(Constant)	1.922	0.357		5.380	0.000
C. Content Knowledge	0.387	0.076	0.444	5.082	0.000
B. Pedagogical Knowledge	0.205	0.063	0.282	3.233	0.002

R = .602, Rsquared = .363, F(2,95) = 27.055, p < .001

The regression analysis on Table 17 examined the influence of TPACK components—specifically content knowledge and pedagogical knowledge —on work engagement among educators. The model was statistically significant, $F(2, 95) = 27.055$, $p < .001$, indicating that the predictors reliably forecast work engagement. With an r-squared value of 0.363, the model explains approximately 36.3% of the variance in work engagement, suggesting a moderate level of predictive power.

Content knowledge emerged as the strongest predictor of work engagement (B = 0.387, β = 0.444, p < .001). This implies that teachers who possess a deep understanding of their subject matter are more likely to feel energized, dedicated, and absorbed in their work. This finding is in line with the research of Akyuz and Yavuz (2019), who found that a solid foundation in content knowledge enhances teachers' confidence and enthusiasm, contributing positively to their engagement.

Similarly, Mishra and Koehler (2016) highlighted the essential role of Content Knowledge in the TPACK framework, asserting that a strong grasp of content leads to more meaningful teaching experiences, which likely fosters greater professional fulfillment.

Pedagogical knowledge also had a significant positive impact on work engagement (B = 0.205, β = 0.282, p = .002). This suggests that an educator's understanding of teaching methods, classroom management, and learning processes contributes significantly to their engagement at work.

The importance of Pedagogical Knowledge in boosting work engagement is supported by the findings of König, et al. (2020), who emphasized that well-developed pedagogical strategies empower teachers to navigate classroom challenges effectively, enhancing job satisfaction and engagement.

In contrast, some studies, such as those by Li, et al. (2021), suggest that pedagogical knowledge alone may not sustain high levels of engagement unless supported by institutional support and technological integration. Technological knowledge, though have shown weakest correlation among the three TPACK components.

Overall, the results affirm that both content and pedagogical knowledge are crucial contributors to teachers' work engagement. These findings emphasize the value of strengthening both domains in teacher training and professional development programs to sustain motivated and effective educators.

Recommendations

From the drawn conclusions, the following recommendations are offered for possible implementation.

1. The school heads may have a broader understanding of how the teachers practice their technological and pedagogical knowledge by providing them trainings and seminars on different application tools using the internet and variety of teaching strategies in that are useful in their lessons. Likewise, the content knowledge and their work engagement to create a culture of learning throughout the school and adopt or refine different practices.

2. The teachers may determine, develop, and enhance their instructional competence and work engagement by engaging in different professional development training courses to further enhance their work performance aligned to the standards set by the department.

3. The future researchers may conduct related studies and satisfy their curiosity about the instructional competence and work engagement practices by teachers who undergone to different training and seminars in enhancing their technological, pedagogical, and content knowledge to improve the quality of education provided to the learners.

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