Technological Competence and Pedagogical Content Knowledge Practices of Junior High School Science Teachers

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Abstracts: The study aimed to assess the technological competence and pedagogical content knowledge practices of Junior High School Science Teachers in Southeast Butuan District 1, Division of Butuan City. A descriptive-correlational design was used, and data were collected from 31 science teachers in the district. A survey questionnaire was administered to assess the participants' level of technological competence in terms of using ICT in teaching, as well as their level of PCK practices in terms of Subject Matter Knowledge (SMK), Instructional Representation Strategies (IRS), Instructional Objective and Context (IOC), and Evaluation of Students Learning (ESU). The Net Agreement Rating (NAR) for their responses on the different areas of TPACK was recorded and cross-tabulated. The findings of the study indicated that the participants demonstrated high levels of technological competence in using ICT in teaching and high levels of PCK practices in relation to SMK, IRS, IOC, and ESU. The study also revealed a moderate positive correlation between the level of technological competence and pedagogical content knowledge practices of the teachers. This suggests that while technological competence may contribute to the enhancement of pedagogical content knowledge practices, there are other factors that can also influence effective teaching. Based on these results, it is recommended that further research be conducted to explore the impact of technology integration on the development of pedagogical content knowledge among teachers. Additionally, identifying other factors that may influence their PCK practices would be beneficial.

Keywords: Descriptive correlational, JHS science teachers, PCK practices technological competence.

1. INTRODUCTION

Using technology extensively makes life easier and offers several benefits to individuals. It can potentially transform how we approach education, including teaching and learning. Technological tools are highly effective both inside and outside the classroom for teachers and students alike. Teachers play a critical role in incorporating technology into their teaching and learning strategies. Therefore, teachers must stay up to date with the latest technological advancements in education and learn how to integrate them into their teaching practices (Aziz Hussin, 2018).

To be able to effectively integrate technology into their teaching practice, teachers must possess Technological Pedagogical Content Knowledge (TPACK). (Patalinghug & Arnado, 2021) proposed the Technological Pedagogical Content Knowledge (TPACK) framework as a means of conceptualizing the knowledge required by teachers to effectively integrate Information and Communication Technology (ICT) into their teaching practice. This framework builds upon (Falloon, 2020) concept of Pedagogical Content Knowledge (PCK), which refers to the knowledge that underpins a teacher's expertise in teaching, by specifically addressing the knowledge required to effectively use technology in the classroom.

Several studies have found that technological competence can enhance PCK development in teachers. Technology can provide teachers with new opportunities for engaging students in the learning process and can help teachers to develop innovative teaching strategies. However, to effectively use technology in teaching, teachers must possess not only technological competence but also PCK competence.

Without an understanding of how to teach subject matter effectively, the use of technology may be ineffective or even detrimental to student learning (Radkowitsch et al., 2020).

In the context of science education, teachers need to provide effective procedures that promote competitive and relevant learning among students. This is because science literacy is a crucial component that enables students to become engaged citizens capable of making decisions and assessments on how to apply science in ways that benefit society, the environment, and human health. (Gamayao et al., 2021). Hence, there is a need for teachers to be provided with professional development support to improve their teaching practices and eventually develop their TPACK competence.

Further, the Department of Education is mandated by the law (RA 10533) to offer an inclusive and responsive curriculum with a strong emphasis on science and technology. The Basic Education Sector Transformation (BEST) program, which falls under this act, seeks to enhance the quality of education specifically in science literacy by providing teacher training and development programs. The program also ensures that there are adequate instructional materials, facilities, and equipment to support the delivery of quality education. Despite the efforts of the educational sector to improve the quality of science education in the country, experts have called the attention of the agency due to the 2018 result released by the Programme for International Student Assessment (PISA), in which the Philippines ranked second lowest in science literacy assessment among 79 participating countries (Laput, 2019). This has raised concerns about the quality of science education in the country, prompting experts to call for improvements in science education, including better training and support for teachers and the integration of technology in teaching.

In the Division of Butuan City, scientific literacy among learners is also a concern. According to the division's data, the overall secondary science MPS is fluctuating from 97.85 % in quarter 1 of S.Y. 2020-2021 to 76.21 % in quarter 4 of S.Y. 2021-2022. While schools in the division are making efforts to increase this percentage annually, specific strategies need to be developed by educational planners to address the underlying concern.

The concerns mentioned above have led the researcher to investigate whether the teachers possess the necessary competence to teach the subject. Although all teachers are LET passers, it cannot be assumed that they are proficient in delivering scientific knowledge effectively. Therefore, it is crucial to delve deeper into this matter. As highlighted by the TPACK framework of (Mouza, 2011), teachers' TPACK practices, which refer to how they use technology to teach specific content and apply pedagogical strategies in the classroom, reflect their TPACK competence. In other words, a teacher who demonstrates strong TPACK practices is likely to have a high level of TPACK competence, while a teacher who struggles to integrate technology, pedagogy, and content knowledge may have lower TPACK competence. With this, the study aimed to assess Junior High School Science Teachers in Southeast Butuan District 1 in terms of their technological competence and the level of pedagogical content knowledge practices. It also aimed to determine whether there is a significant relationship between technological competence and the level of pedagogical content knowledge practices of the participants.

Further to this, the importance of technology in education is widely recognized in the Philippines and is evident in the numerous studies that have explored the technological competence of teachers in using ICT in teaching and learning (Shyamlee & Phil, n.d.). However, in the context of Pedagogical Content Knowledge, research studies have investigated the efficacy of science teachers' PCK, but they have only examined limited variables in a qualitative manner. Consequently, there is insufficient evidence available to assess science teachers' PCK practices (Krepf et al., 2018) With this, the study also aimed to further provide more comprehensive and empirical evidence on the topic.

Lastly, the result of this study served as a baseline in the crafting of the proposed training and development program that could help in enhancing the competencies of the teachers, thus, contributing to a more meaningful and effective teaching and learning experience.

2. THEORETICAL FRAMEWORK

Technological competence and pedagogical content knowledge are vital practices for teachers in today's digital age. Technological competence refers to teachers' ability to effectively navigate and utilize various digital tools and technologies to enhance teaching and learning. It involves having the skills and knowledge to select, integrate, and manage technology resources that align with instructional goals. On the other hand, pedagogical content knowledge refers to teachers' deep understanding of both the subject matter they teach and the most effective instructional strategies to convey that content to students. It involves knowing how to adapt teaching methods, design meaningful learning experiences, and provide appropriate feedback. When teachers possess a strong combination of technological competence and pedagogical content knowledge, they are equipped to create engaging and impactful learning environments that leverage the power of technology to maximize student outcomes.

The theoretical perspectives on technological competence are diverse, with various scholars providing different insights on how these two competencies interact and influence teaching practices. One of the primary theoretical frameworks in which the study is anchored is the Technological Pedagogical Content Knowledge (TPACK) framework (Uygun, 2013). According to this framework, effective technology integration in teaching requires a combination of three types of knowledge: content knowledge, pedagogical knowledge, and technological knowledge. The TPACK framework posits that technology is not a separate entity from content and pedagogy, but rather, it is an integral part of both. Therefore, teachers need to develop TPACK, which is the interplay of all three types of knowledge, to effectively integrate technology into their teaching practices.

Another framework in which the study is also anchored is the SAMR model of Puentedura (2010). The SAMR model is a framework that provides a way to evaluate how technology is being integrated into teaching practices. The model identifies four levels of technology integration: substitution, augmentation, modification, and redefinition. The higher levels of the SAMR model require teachers to possess higher levels of PCK competence, as they involve transforming traditional teaching practices into more innovative and effective practices using technology.

In addition, the study is also anchored in the Dynamic Interaction Model of Teachers' Technological Pedagogical Content Knowledge (DIT-TPACK) (Voogt et al., 2012). This model suggests that technological competence and PCK competence of teachers are not static but rather dynamic and continually changing. The model posits that as teachers use technology in their teaching practices, their PCK competence develops and improves, leading to more effective teaching practices. Therefore, professional development programs should aim to provide teachers with opportunities to develop both technological competence and PCK competence and create a dynamic interaction between the two competencies.

Generally, theoretical perspectives provide valuable insights into the relationship between technological competence and PCK competence of teachers. The TPACK framework, the SAMR model, and the DIT-TPACK model are just a few of the theoretical perspectives that highlight the importance of developing both competencies in teachers.

3. METHODOLOGY

This study utilized a quantitative research method and employed the descriptive-correlational design, which combines descriptive and correlational research approaches to describe and examine the relationship between variables without asserting causality. The study aimed to assess the level of pedagogical content knowledge (PCK) practices and technological competence of 31 junior high school science teachers from seven public secondary schools in Southeast Butuan District 1, namely Tagabaca Integrated School, Salvacion Integrated School, Sumile National High School, Maibu National High School, Pigdaulan National High School, Aviola Village Integrated School-Main Campus, and Alviola Village Integrated School-Annex. Simple random sampling was used to ensure that the sample accurately represented the population.

Data was collected using a survey questionnaire consisting of three parts. The first part collected demographic information such as sex, age, educational attainment, length of service, number of years teaching science, and professional training attended. The second and third parts determined the level of PCK practices and technological competence, respectively.

The instrument used to assess the level of PCK practices was adopted from the study of Cordova and Linaugo (2022) and contained 28 statements that correspond to PCK practices in terms of subject matter knowledge, instructional representation strategies, instructional objective and context, and evaluation of students' understanding. The instrument used to assess technological competence was adopted from the study of Türel et al. (2017) and consisted of eight statements that expressed a particular indicator for ICT skills used in teaching.

This study aimed to examine the relationship between the level of technological competence and pedagogical content knowledge practices of the participants. To analyze the data, statistical tools such as frequency distribution, mean, and standard deviation were used. Additionally, correlation analysis was conducted to determine the relationship between the level of technological competence and PCK practices of the participants.

4. RESULTS AND DISCUSSION

The demographic profile of the participants reveals several key findings. Firstly, there was a significant gender imbalance in the sample, with most participants being female (80.65%), while males accounted for a smaller percentage (19.35%). This suggests a higher representation of females in the teaching profession. In terms of age distribution, a notable proportion of participants fell within the 26-30 age range (38.71%), followed by those aged 31 years and above (51.61%). These results indicate that the study primarily involved early to mid-career science teachers.

Regarding educational attainment, 45.16% of the participants held a bachelor's degree, while 54.84% had completed master's degree units. None of the participants had obtained a master's or doctorate degree, or even completed doctoral degree units. This suggests that most participants had not yet acquired advanced academic degrees, highlighting a potential gap in higher educational qualifications among the sample.

The length of service varied among participants, with the largest group having 4 to 6 years of experience (38.71%). Additionally, a significant portion of the participants reported 0 to 3 years of service (35.48%), indicating the inclusion of relatively inexperienced teachers in the study. However, a small number of participants (3.23%) had 11 years and above of service, suggesting the inclusion of more experienced teachers as well.

Table 1. Demographic Profile of the Participants in Terms of Gender, Age, Educational Attainment, Length of Service, Number of Years Teaching Science and Professional Trainings Attended.

Demographic Profile		**F**	**%**
Gender			
	Male	6	19.35
	Female	25	80.65
Age			
	21 – 25 years old	3	9.68
	26 – 30 years old	12	38.71
	31 years old & above	16	51.61
Educational Attainment			
	Bachelor's Degree	14	45.16
	With Master's Degree units	17	54.84
	Master's Degree	0	0.00
	With Doctorate Degree units	0	0.00
	Doctorate Degree	0	0.00
Length of Service			
	0 to 3 years	11	35.48
	4 to 6 years	12	38.71
	7 to 10 years	7	22.58
	11 years and above	1	3.23
Number of Years Teaching Science			
	0 to 3 years	11	35.48
	4 to 6 years	12	38.71
	7 to 10 years	7	22.58
	11 years and above	1	3.23
Professional Training Attended			
	ICT trainings	23	74.19
	Content Knowledge related	20	64.52
	Pedagogy related	25	80.65
	No trainings attended	2	6.45

The distribution of participants based on the number of years teaching science closely mirrored the length of service distribution. The majority of participants had 4 to 6 years of experience teaching science (38.71%), while a notable portion reported 0 to 3 years of experience (35.48%), indicating the involvement of early-career teachers in the study.

Regarding professional training attended, pedagogy-related trainings were the most common (80.65%), indicating a focus on improving teaching methods and instructional strategies. A substantial proportion of participants also attended ICT trainings (74.19%), suggesting an emphasis on integrating technology in science education. Moreover, 64.52% of participants reported attending content knowledge-related trainings, highlighting the importance placed on enhancing subject matter expertise.

Lastly, a small number of participants (6.45%) reported not attending any professional trainings. This finding raises potential implications for their professional development and instructional effectiveness, as they may not have accessed the benefits of additional training opportunities.

Figure 1 presents the Level of the participants' Pedagogical Content Knowledge practices in terms of Subject Matter Knowledge (SMK). As shown in the figure, the highest net agreement rating was obtained by the statements "I go deep into contents to yield richer learning "and "I know the whole structure and direction of this SMK" with a rating of 83.87% (very strong). This suggests that the teachers actively engage in in-depth exploration of the subject matter to create more meaningful and comprehensive learning experiences for their students. Additionally, they demonstrate a thorough understanding of the overall structure and direction of the specific subject matter or curriculum (SMK) they are referring to. This very strong practice indicates that these teachers actively implement these strategies in their teaching, resulting in enhanced learning outcomes and a more effective educational experience for their students.

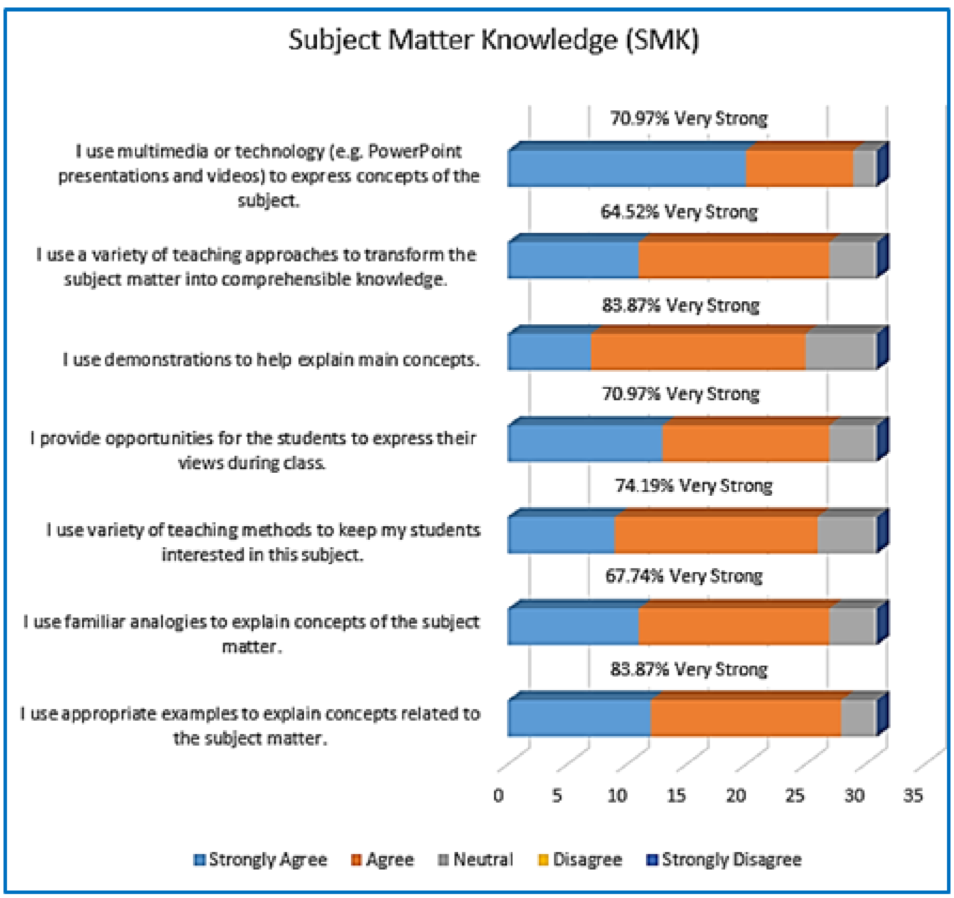

Figure 1. Subject Matter Knowledge (SMK).

Meanwhile, the statement "I know how theories or principles of the subject have been developed" obtained the lowest net agreement rating of 64.52%. Although this rating is slightly lower, it still indicates a very strong level of practice among teachers.

Despite the slightly lower agreement, it is evident that teachers possess a deep understanding of the historical context, foundational concepts, and evolution of the theories or principles in their subject area. They demonstrate knowledge about the origins, influential figures, and key contributions that have shaped these theories or principles over time. This highlights the teachers' commitment to acquiring and sharing comprehensive knowledge in their field, which ultimately contributes to their effectiveness in teaching and promoting a deeper understanding of the subject matter among their students.

Overall, Figure 1 shows that the teachers have a high level of pedagogical content knowledge practices in terms of Subject Matter Knowledge (SMK). This can be attributed to the fact that a significant proportion of teachers have participated in professional development programs focused on enhancing their content knowledge. This result implies that teachers are well-prepared and equipped with the necessary knowledge and skills to provide quality instruction. They can accurately and confidently explain complex concepts, provide relevant examples, and answer students' questions. They are familiar with the latest developments, research, and advancements in their field and incorporate this knowledge into their teaching.

The results are consistent with the study of Cordova and Linaugo (2022) which also reported that science teachers in their area demonstrated high levels of PCK practices regarding Subject Matter Knowledge (SMK). According to Sancassani (2021), subject matter knowledge is a powerful factor in predicting teacher effectiveness. Additionally, Lawyer (2019) discovered that possessing subject matter knowledge as a teacher contributes to effective teaching and leads to positive student academic performance.

Azuelo et al. (2015) also highlighted the significance of subject matter knowledge in the professional development of teachers to enhance their effectiveness, which ultimately leads to improved student learning outcomes.

Figure 2 presents the level of the participants' Pedagogical Content Knowledge practices in terms of Instructional Representation Strategies (IRS). As shown in the figure, the highest net agreement rating was obtained by the statement " I use multimedia or technology to express concepts of the study" with a rating of 93.55 % (very strong) .

It means that teachers effectively incorporate various forms of multimedia tools and technology into their teaching methods. They utilize these resources to convey and illustrate complex concepts in a visual or interactive manner. This very strong practice indicates that teachers recognize the value of multimedia and technology as effective educational tools to facilitate understanding, promote active participation, and support the overall learning process.

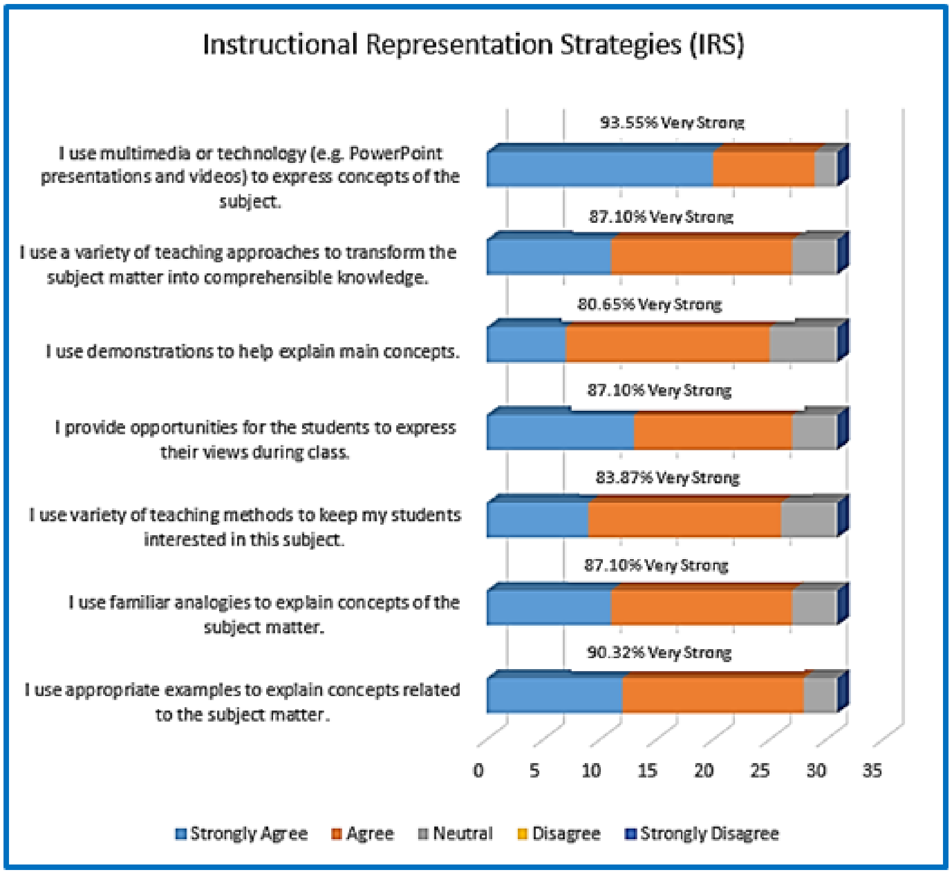

Figure 2. Instructional Representation Strategies (IRS).

In terms of the lowest net agreement rating, it was obtained by the statement “I use demonstrations to help explain the main concepts” with a rating of 80.65 % but still indicates a very strong level of practice. It means that teachers employ hands-on or visual examples during their instruction to clarify and illustrate key ideas. They actively engage students by providing real-life or concrete demonstrations that make abstract or complex concepts more understandable and relatable.

Overall, the data in Figure 4 indicates that the teachers have a high level of pedagogical content knowledge practices in terms of instructional representation strategies. This could be explained by the fact that a considerable number of teachers have undergone professional development training focused on pedagogy. This result suggests that teachers prioritize effective communication and aim to make complex concepts more accessible to their students. They recognize the importance of using diverse instructional methods to accommodate different learning preferences and promote deeper comprehension.

The results also conform with the results in the study of Cordova and Linaugo (2022) in which they found out that science teachers have very great extent of Pedagogical Content Knowledge practices in terms of Instructional Representation Strategies (IRS). According to (Ginja & Chen, 2020) instructional representation strategies are important in teaching and learning as they enable teachers to present information in a variety of ways, which cater to different learning styles and preferences of students. Kapur (2023) further stated that effective instructional strategies are considered crucial for enhancing student learning. If these strategies are implemented in an orderly manner, they can significantly help students overcome any obstacles they may face in their academic learning. Additionally, Ma’rufi et al. (2018) also stated that in order to transform content knowledge, the teacher should use different representations and help students to make the connection between different representations.

Figure 3 presents the Level of the participants’ Pedagogical Content Knowledge practices in terms of

Instructional Objectives and Context (IOC). As shown in the figure, the highest net agreement rating was obtained by the statements “I create interesting simulation activities to promote my students’ interest in learning” and “I provide an appropriate interaction and good atmosphere in class” with a rating of 90.32 % (very strong).This suggest that teachers actively design and implement interactive and engaging activities that simulate real-life scenarios or situations. These activities capture students' attention, spark their curiosity, and foster their enthusiasm for learning. They also create a positive and inclusive learning environment. They encourage active participation, collaboration, and open communication among students. By establishing a supportive and respectful atmosphere, teachers facilitate meaningful interactions and promote a sense of belonging, which enhances student engagement and promotes effective learning.

Moreover, it can be gleaned in the figure that the lowest net agreement rating was obtained by the statement “I cope with classroom context appropriately” with a rating of 80.65 % but still indicates a very strong level of practice. It means that they possess the ability to effectively manage and adapt to various situations and challenges that arise within the classroom environment. They demonstrate flexibility and responsiveness in their teaching approach, considering the diverse needs and characteristics of their students.

In general, the data presented in figure 5 suggest that teachers have a high level of pedagogical content knowledge practices in terms of instructional objectives and context. One possible explanation for this is that a notable percentage of teachers have participated in professional development programs that specifically target pedagogical training. This result implies that teachers demonstrate their ability to align their teaching goals with student needs, design clear and measurable objectives, and create an inclusive and supportive learning environment that maximizes student engagement and learning outcomes.

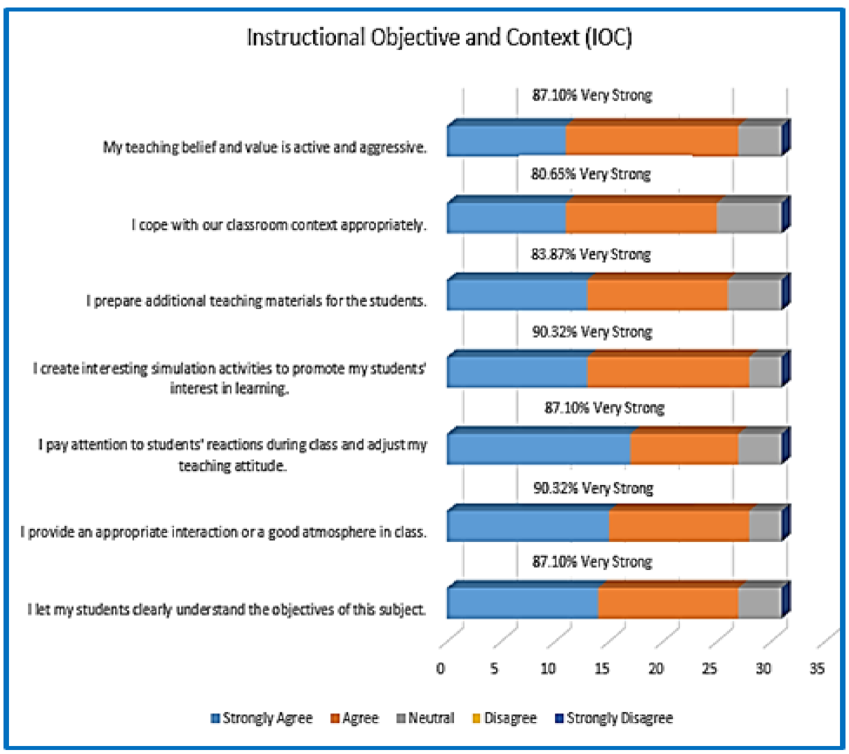

Figure 3. Instructional Objective and Context (IOC).

As stated by (Thongsongsee, n.d.), the instructional objective and context (IOC) play a crucial role in shaping the instructional decisions and strategies that teachers use to facilitate learning and promote student achievement. Teachers who can adapt their teaching methods to suit the specific context in which they are teaching can promote more effective learning outcomes for their students (Tomlinson & Moon, 2013). Jacob et al.,(2020) further emphasized that teachers with high levels of PCK in instructional objectives are better able to set clear learning goals and objectives for their students. This, in turn, can lead to improved student performance and academic achievement. Additionally, teachers with high levels of PCK in instructional context are better able to create a positive and engaging learning environment, adapt their teaching strategies to the needs of their students, and use effective instructional practices.

Figure 4 presents the Level of the participants' Pedagogical Content Knowledge practices in terms of Evaluation of Students Understanding (ESU). As shown in the figure, the highest net agreement rating was obtained by the statements " I provide test to help my students realize the learning situation" and "I ask questions to evaluate my students' understanding of a topic" with a rating of 90.32% (very strong). This suggests that teachers are actively involved in assessing student learning and understanding. When teachers provide tests to help students realize the learning situation, it means they use assessments as a tool to measure students' comprehension and progress. These tests create awareness among students about their level of understanding and highlight areas that need further attention.

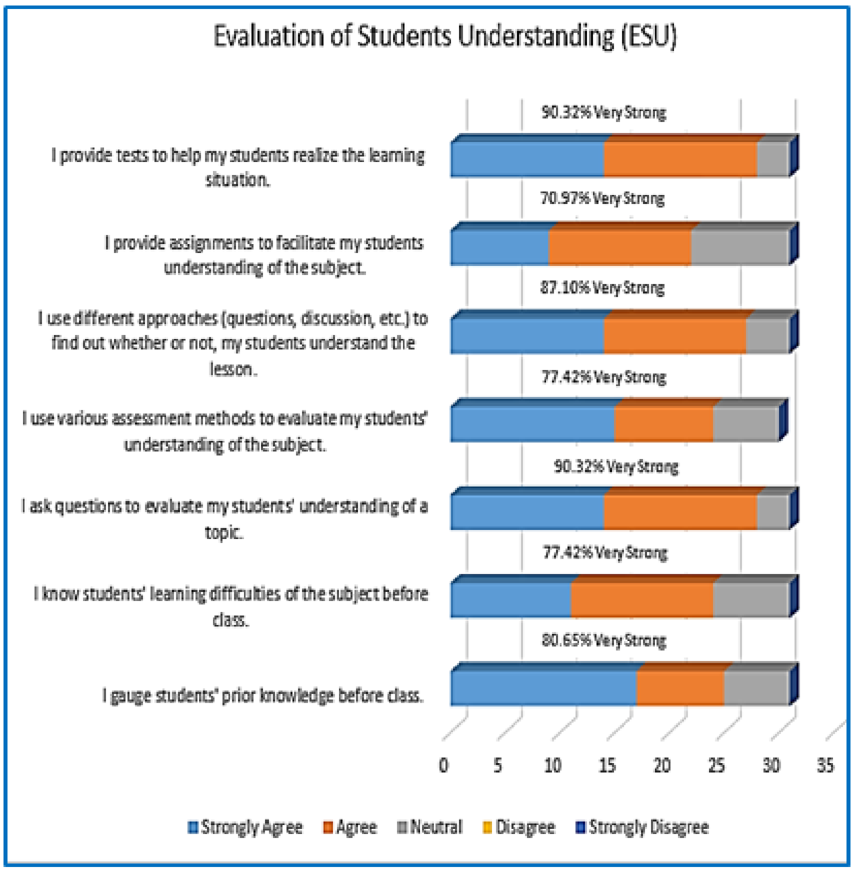

Figure 4. Evaluation of Students Understanding (ESU).

Similarly, when teachers ask questions to evaluate students' understanding of a topic, it shows their commitment to ongoing assessment and feedback. By asking questions, teachers can assess students' comprehension, identify any misconceptions, and determine the effectiveness of their teaching methods. This practice fosters critical thinking and enables students to articulate their understanding while allowing teachers to adapt their teaching strategies accordingly.

In terms of the lowest net agreement rating, it can be seen from Figure 6 that the statement "I provide assignments to facilitate my students' understanding of the subject " got the rating of 70.97 % but still indicate a very strong level of practice. It means that they assign tasks or activities to their students with the goal of promoting comprehension and mastery of the subject matter. These assignments are designed to reinforce the lessons taught in class, encourage independent thinking and problem-solving, and allow students to apply their knowledge in practical contexts.

The data in Figure 6 shows that the teachers have high levels of pedagogical content knowledge practices in terms of Evaluation of Students' Learning (ESU). This can be accounted for by the fact that a significant number of teachers have received specialized professional development training that emphasizes pedagogical approaches. Th implies that they are highly skilled and proficient in assessing and measuring the progress and achievements of their students and that they have a deep understanding of the learning objectives and standards of the subject matter, allowing them to design assessments that align with the curriculum and effectively measure student knowledge and skills.

As stated by Suskie (2018), evaluation skills enable teachers to provide feedback to students about their progress and understanding, which can motivate them to take ownership of their learning and make improvements. Furthermore, evaluation skills are essential for teachers to meet accountability standards and ensure that their teaching is meeting the needs of their students.

Research has shown that teachers with high levels of PCK in terms of evaluating students' understanding are better able to diagnose and address students' misconceptions (Kunter et al., 2013). They are also more likely to use assessment data to guide their instructional decisions, which can lead to better student learning outcomes (Van Driel ,2021).

Figure 5 presents the level of technological competence of the participants in terms of the use of ICT in teaching. As shown in the figure, the highest net agreement rating was obtained by the statement" I can use presentation when delivering instruction in class " with a rating of 90.32 % (very strong).It means that that teachers possess the necessary skills, knowledge, and proficiency to effectively utilize presentation tools and techniques to enhance their teaching. They are proficient in creating visually appealing and informative presentations that effectively communicate and deliver instructional content to students. By leveraging presentations, the teacher can make their instruction more engaging, visually appealing, and interactive, thereby enhancing the learning experience for students.

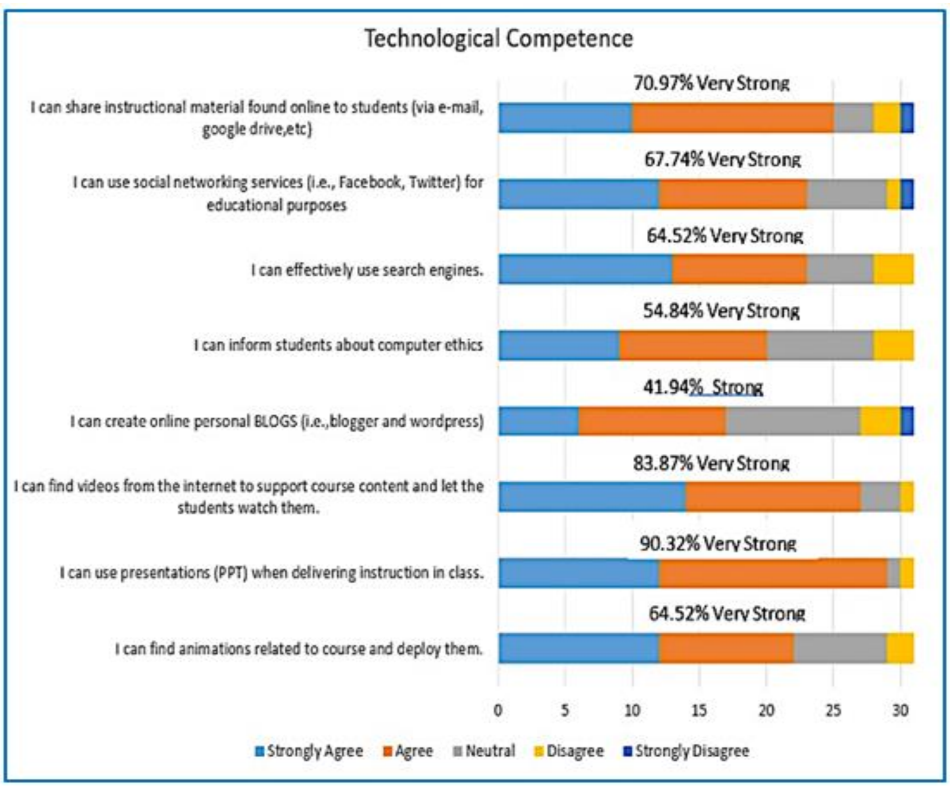

Figure 5. Technological Competence.

Meanwhile, the statement “I can create online personal blogs” obtained the lowest net agreement of 41.94 % (strong). This indicates that the teachers possess a satisfactory level of proficiency in managing online platforms for personal blogging. However, there is room for improvement in their skills and knowledge regarding various aspects of blogging. It is worth noting that having a lower competence in creating online personal blogs does not imply a deficiency in overall digital literacy or proficiency in other areas. Rather, it suggests that further support, training, or practice is needed to cultivate the necessary skills and expertise in this specific domain.

Based on the data presented in Figure 7, it can be inferred that the teachers demonstrate a high level of technological competence when it comes to incorporating ICT (Information and Communication Technology) into their teaching practices. This can be understood by the fact that a substantial proportion of teachers have undergone specialized professional development programs that center on ICT training. The result suggests that they possess the necessary skills and knowledge to effectively integrate technology into

their instructional practices. These teachers are likely proficient in selecting and utilizing suitable technological resources, creating engaging multimedia presentations, facilitating online discussions and activities, and making use of educational applications and platforms. Their high level of ICT competence indicates their ability to harness technology as a valuable tool for enhancing teaching and learning outcomes. It enables them to promote student engagement, facilitate personalized learning experiences, and cultivate digital literacy skills among their students.

The results conform with the study of Sauers and Mcleod (2018) in which they found out that teachers who have a higher level of technological competency are more likely to integrate technology into their teaching practices. Teachers who feel more comfortable and confident using technology are more likely to use it effectively in the classroom to enhance student learning.

According to the National Education Association (NEA, 2017), technological competence is one of the 21st-century skills that students need to succeed in the global economy. By integrating technology into their teaching practices, teachers can help students develop the digital literacy and problem-solving skills necessary to succeed in the modern workplace.

In addition, having technological competence is important for teachers to keep up with the changing needs and expectations of students. According to a study by UNESCO (2015), students today have grown up in a digital world and are accustomed to using technology in their everyday lives. Therefore, teachers who lack technological competence may struggle to engage and motivate their students, who are used to using technology to access information and communicate with others.

Table 2 presents the correlation analysis between the level of technological competence and the level of pedagogical content knowledge practices of the participants. The "r-value" in the table represents the correlation coefficient, which measures the strength of the relationship between the two variables. The values for SMK, IRS, IOC, and ESU are 0.585, 0.608, 0.588, and 0.537, respectively, indicating a moderate positive correlation between technological competence and pedagogical content knowledge practices. The "p-value" represents the probability of obtaining the observed correlation coefficient if there was no true correlation between the two variables. In this case, all p-values are less than 0.05, indicating that the observed correlations are statistically significant.

Table 2. Correlation Analysis between the Level of Technological Competence and the Level of Pedagogical Content Knowledge Practices of the Participants.

Variables	R-Value	P-Value	Interpretation	Decision
Technological Competence and				
Pedagogical Content Knowledge Practices				
▪ Subject Matter Knowledge (SMK)	0.585	0.001	Significant	Reject Ho
▪ Instructional Representation Strategies (IRS)	0.608	0.000	Significant	Reject Ho
▪ Instructional Objective and Context (IOC)	0.588	0.001	Significant	Reject Ho
▪ Evaluation of Students Understanding (ESU)	0.537	0.002	Significant	Reject Ho

The findings depicted in Table 2 reveal a moderate positive correlation between technological competence and pedagogical content knowledge practices, but it is important to note that this correlation does not indicate a direct causal relationship.

While improvements in technological competence tend to coincide with enhancements in pedagogical content knowledge practices, the correlation is not notably strong. This implies that while technological competence can contribute to improved pedagogical content knowledge practices, there are other influential factors at play in effective teaching. Such factors may encompass teaching experience, availability of professional development opportunities, and other relevant considerations.

Furthermore, the findings are in line with previous research. For instance, Instefjord and Munthe (2017) conducted a study on teacher educators' self-reported efficacy and digital competence, and they found a positive correlation between the two variables. This suggests that when educators perceive themselves as more effective in utilizing technology, they are likely to exhibit higher levels of digital competence.

Additionally, (Kim et al., 2019) emphasized the crucial role of technology support in improving teaching practices. This further supports the idea that technological competence can contribute to enhanced pedagogical content knowledge practices. When teachers receive appropriate technology support, such as access to resources, training, and assistance, it positively impacts their ability to incorporate technology effectively into their teaching methods.

Lastly, (Huang & Lajoie, 2021) highlighted some ways in which technology can improve Pedagogical Content Knowledge (PCK) practices.

They emphasized that technology could provide access to various resources, materials, and activities for developing and delivering effective lessons and it allows teachers to differentiate their instruction and personalize learning for individual students.

5. CONCLUSION AND RECOMMENDATION

The study's findings indicate that the participating science teachers demonstrated high levels of technological competence when using ICT for teaching. They also exhibited high levels of pedagogical content knowledge (PCK) practices in various areas, including Subject Matter Knowledge (SMK), Instructional Representation Strategies (IRS), Instructional Objective and Context (IOC), and Evaluation of Students Learning (ESU), as evaluated through the Net Agreement Rating (NAR) within the TPACK framework.

Furthermore, a moderate positive correlation was observed between the teachers' level of technological competence and their pedagogical content knowledge practices. These results suggest that while technology proficiency has the potential to enhance pedagogical content knowledge practices, other factors also influence teaching effectiveness.

The study underscores the crucial relationship between technological competence and pedagogical content knowledge practices among junior high school science teachers. It emphasizes the importance of effectively integrating technology into science instruction to improve student learning outcomes. To achieve this, there is a need for professional development programs and ongoing support that empower teachers with the necessary skills and knowledge to navigate and leverage technology in the classroom.

By fostering both technological competence and pedagogical content knowledge, educators can create dynamic learning environments that engage students, foster critical thinking, and prepare them for an increasingly digital future. Ultimately, this study contributes to the broader conversation on teacher preparation and professional growth, advocating for the continuous development of educators' technological proficiency to optimize science education in junior high schools.

6. ACKNOWLEDGEMENT

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