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Teachers Competencies' for Pedagogical Practice in Special and Inclusive Education towards the Development of TPACK Framework

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Abstract: ***This study aimed to determine the profiles and competency levels of Special Education Teachers (SpEdT) and Receiving Teachers (ReT) in applying the TPACK framework to facilitate learning in an inclusive setting. It assessed the components of the TPACK framework that required improvement based on the teachers' competencies and examined the significant relationship between the teachers' profiles and their competency in applying the TPACK framework. The findings served as the basis for a teacher development plan for the 2024–2025 school year in selected public schools in the Tri-City area of Metro Cebu that offered Special and Inclusive Education (SIE) programs. The study employed varied research designs, including cross-sectional, correlational, and descriptive correlation approaches. The collected data were analyzed using frequency, weighted mean, and Chi-square tests. The research found that most respondents were female, aged 44 to 53, married, and pursuing a master's degree, with 13 to 18 years of experience in managing 11 to 20 learners, primarily those with intellectual disabilities, autism spectrum disorders, or orthopedic disabilities, in self-contained classrooms. While all TPACK components were rated as "Competent," only Pedagogical Knowledge (PK) was rated as "Highly Competent," whereas Technological Knowledge (TK), Pedagogical Content Knowledge (PCK), and Technological Content Knowledge (TCK) received lower scores. The study found no significant relationship between most profile factors and TPACK competencies. However, the sex of the teachers was significantly related to their Content Knowledge (CK) competency, while Pedagogical Content Knowledge (PCK) and Technological Pedagogical Knowledge (TPK) were significantly related to civil status. Additionally, the type of class assignment had a significant relationship with CK competency. Overall, SpEdT and ReT teachers were considered competent in applying the TPACK framework for inclusive education. The study recommended implementing a development plan that included professional development, partnerships, and ongoing competency monitoring.***

Keywords: Special Education and Inclusive Education, Cross-Sectional, Correlational, Descriptive Correlation, Competency, LSENs, TPACK, Cebu, Philippines

I. INTRODUCTION

The systematic implementation of the Special and Inclusive Education (SIE) program was the most significant educational change over time. This program promoted equal opportunities and improved the quality of life by fostering a diverse, friendly, and respectful environment for all. Learners with Special Educational Needs (LSENs) were supported through this program. These learners faced challenges in different developmental domains, such as cognitive, social, emotional, behavioral, and practical skills. The SIE program was not only for LSENs but also for learners from other racial, ethnic, and religious backgrounds. Moreover, the program fostered a multidisciplinary approach by encouraging teachers, parents, professionals from various fields, advocates, community members, and other members of the Multidisciplinary Team (MTD) to collaborate. This collaboration provided viewpoints and insights that helped learners become productive and engaged members of contemporary society. To implement the program, reliance on positive attitudes toward the benefits of the SIE program was insufficient. Instead, it was important to reassess school management strategies, particularly the integration of technology into the teaching and learning process. The application of technology in educational practices was not a new phenomenon in developed countries (Akram et al., 2022), but some researchers identified gaps. According to Oyedotun (2020), teachers faced challenges in using technology in education due to digital inequalities, poor technological infrastructure, insufficient training, and heavy workloads. The study conducted by Akram et al. (2022) showed that teachers struggled to use ICT effectively in their teaching because they lacked the necessary technological skills.

In addition, the study by Alarba et al. (2023) in the Philippines evaluated the competency of teachers in integrating the Technological and Pedagogical Content Knowledge (TPACK) framework for Hyflex teaching and learning. It found that teachers were competent in content knowledge and pedagogical knowledge but had lower competency in technological knowledge.

At that time, technology became a necessity in education because it provided efficiency, accessibility, and engagement. To effectively use technology in the SIE program, Special Education Teachers (SpEdT) and Receiving Teachers (ReT) needed to be competent in using technology in the teaching and learning process. Singh and Malik (2023) suggested that using the TPACK framework helped teachers become confident and effective in their teaching practices. The TPACK framework focused on applying effective technology to teaching specific subjects. It highlighted the connection between technology, pedagogy, and content. The TPACK framework guided teachers in using educational technology to effectively design a Technology-Enhanced (TE) instruction. Teaching and learning became more integrated and effective when the TPACK framework was used in conjunction with learner-centered instructional design. Furthermore, the TPACK framework assisted the MTD in organizing instructional support, materials, assessment strategies, and learning methods in a way that best suited the needs of learners, ensuring their active participation in learning activities. To provide an inclusive and accessible learning environment, the SIE program was implemented with the help of the TPACK framework, which contributed to designing learning processes tailored to learners' needs and paces (Mutiani et al., 2021). However, simply incorporating technology into classrooms was insufficient; it was also critical to assess teachers' proficiency in applying technology to classroom practices (Singh & Malik, 2023).

The researcher observed that technology was fully integrated into the preliminary practices of teachers; however, there was no concrete determination of teachers' competency levels in applying the TPACK framework to manage all types of learners, including LSENs, in selected schools or centers offering the SIE program in the tri-city area of Metro Cebu. The study determined the profile and TPACK competency of the SpEdTs and RevTs and their relationship to each other. Moreover, it assessed the specific components of the TPACK framework that needed improvement based on the competencies of the SpEdTs and RevTs. In addition, the study's results served as a constructive source of information for creating a development plan that provided a comprehensive approach to professional development. This plan equipped SpEdTs and RevTs with the necessary skills to integrate technology seamlessly into their teaching, enabling them to assess and assist all types of learners, including LSENs, to become functional participants in the teaching and learning process.

II. METHODOLOGY

A. Research Design

This research used a pure quantitative research design. Sub-problem number one and two employed a cross-sectional survey research design since the data collection did not involve variable manipulation and allowed researchers to examine various characteristics of the research sample, such as age, educational background, gender, or other factors (Creswell and Creswell, 2018). For sub-problems three and four, it employed a descriptive correlation design to examine the relationship between variables and describe their characteristics.

B. Sampling Design, Research Respondents, and Environment

This study employed purposive sampling, aligning with its quantitative methodology, to ensure that participants provided relevant and precise data. A total of 75 teachers participated, comprising sixty-nine SpEdT and six ReT from three public schools in Metro Cebu. These teachers, who managed LSENs with diverse needs such as Intellectual Disabilities, Visual Impairments, Hearing Impairments, and Gifted and Talented learners, met specific criteria, including a minimum of five years of teaching experience under the SIE program, a degree in Special and Inclusive Education, and experience in inclusive or self-contained classrooms. The study was conducted in three public schools offering the SIE program: Zapatera Elementary School – Special Education Center in Cebu City, Mandaue City Central Special Education School, and Lapu-Lapu City Central Elementary School - Special Needs Education Center. These schools adhered to DepEd standards, offered flexible learning spaces, specialized instruction for various disabilities, and utilized assistive technology. They followed the DepEd curriculum with modifications to support and manage LSENs, implemented inclusive practices, and adopted a multidisciplinary approach to ensure comprehensive support for LSENs.

C. Research Instrument

In this research, a qualitative method was employed, utilizing a demographic profiling instrument and an adapted tool based on the study of Valtonen et al. (2017), TPACK for 21st-Century Skills (TPACK-21). The adapted self-assessment tool was designed to collect data on pre-service teachers' perceptions of integrating technology in a pedagogically meaningful way within the framework of twenty-first-century skills. The research instrument consisted of two main parts.

The first part of the survey tool covered the demographic profiles of the SpEdTs and ReTs. The second part measured the competency of the SpEdTs and ReTs in the seven components of the TPACK framework during the teaching and learning process, specifically in managing different types of learners, including LSENs. Each component of the TPACK framework included seven (7) items and contained statements aligned with twenty-first-century skills. Respondents rated their competency levels across the TPACK framework components. The scoring procedure, an adaptation of the original tool, involved modifying the original four-point Likert scale by removing the "neutral" response option. The revised scale consisted of four points: four (4) for highly competent, three (3) for competent, two (2) for less competent, and one (1) for not competent. The reliability of TPACK-21 was verified through Cronbach's alphas, which demonstrated strong internal consistency across all areas of the TPACK framework.

D. Statistical Treatment

This study used various statistical tools to analyze and interpret the data gathered. Frequency was employed to determine or count the number of occurrences for each variable in the demographic profile of the teacher respondents. Percentage, commonly used to represent statistical data, was utilized alongside frequency counts to show the proportion of a variable against the total number of variables, with "percent" signifying "per hundred." The Weighted Mean was calculated to determine the average of all respondents' scores based on the seven competencies in the TPACK framework. This overall weighted mean provided essential data to evaluate the competencies of SpEdT and Res in applying the TPACK framework within the teaching and learning process for all types of learners, including LSENs. Additionally, the Chi-Square Test of Independence was used to identify the significant relationship between the respondents' demographic profiles and their level of competency in applying the TPACK framework. These tools collectively ensured a thorough and accurate analysis of the data.

E. Data Gathering Procedure

The letter of intent was sent to the division offices of Cebu City, Mandaue City, and Lapu-Lapu City. The letter contained the complete procedure of the study, including its goal, objectives, and the potential impact on the selected public schools. For procedural safety, the letter of intent included the signatures of the researcher, the researcher's adviser, and the dean of the Cebu Technological University Main Campus College of Education. This letter underwent legal evaluation by the legal unit office in each chosen school division. Once the letter was approved, the researcher secured separate written permissions, attaching a transmittal letter signed by the School Division Superintendent, and sent them to the school heads of Zapatera Elementary School-Special Education Center, Mandaue City Central Special Education Center, and Lapu-Lapu City Central Elementary School-Special Needs Education Center. After the request to conduct a survey was granted, the researchers had a face-to-face meeting with the school heads to schedule the data gathering. The scheduling was done to comply with DepEd Order No. 9, s. 2005, entitled Instituting Measures to Increase Engaged Time-on-Task and Ensuring Compliance. Once the data gathering was scheduled for a specific date and time, the researchers prepared the questionnaires for distribution. To ensure accurate and reliable outcomes, the questionnaires were personally administered by the researchers, who clarified the directions and explained the purpose of the study to the respondents. The researchers also assured the respondents that their answers would be treated with the utmost confidentiality.

III. RESULTS AND DISCUSSION

A. Demographic Profile Of The Respondents

Demographic elements of the teachers, such as age, sex, marital status, highest educational attainment, type of learners' disability in the class, subjects taught, teaching hours per week, and seminars/training in digital literacy could have affect teachers' self-efficacy, attitudes toward inclusion, and overall job satisfaction. Examining the demographic profile of teachers under SIE program did not only enrich our understanding of their demographic makeup but also guides the development of targeted interventions and support mechanisms that address their specific needs and challenges within the educational field of SIE program.

Table 2: Age of the Teachers from the Three Identified School

	Frequency	Percent
Age [in years]		
24-33	25	34.25%
34-43	18	24.66%
44-53	27	36.99%
54-63	3	4.11%

Base from the data in the table 2, the majority of teacher respondents, totaling 27 teacher respondents or 36.99%, fell within the 44-53 age range. Following closely behind were 25 teacher respondents, making up 34.25% of the participants, who were between 24 and 33 years old. The remaining 18 teacher respondents (24.66%) and 3 respondents (4.11%) were distributed across the 34–43 and 54–63 age categories, respectively.

The data implies that the surveyed participants skewed towards older age brackets, revealing a demographic bias favoring older age groups. Older SpEdT and RevT had difficulties applying modern assistive and adaptive technology in managing all types of learners including LSENs.Base from the study conducted in 2023 by the National Center for Education Statistics (NCES), the highest numbers of SpEdT were found within the age brackets of 35-39 years (52,016 individuals), 40-44 years (51,952 individuals), and 30-34 years (50,686 individuals). This distribution indicates a substantial presence of professionals in the middle of their careers and a significant inflow of younger teachers joining the profession. Special education teachers span a wide range of age groups, from young professionals just starting their careers to experienced teachers nearing retirement. The distribution of teachers among different age brackets was significant. In Joo et al. (2021) research suggests that a substantial portion (36.99%) of teachers aged 44-53 had substantial pedagogical and content knowledge but might have require additional support in technological skills. Additionally, Tondeur et al. (2019) findings correspond to the significant presence of younger teachers (34.25% aged 24-33), indicating that while these teachers might have possessed strong technological proficiency, they might have need support in integrating this knowledge with specialized pedagogical practices in special education. The research conducted by Cahyani et.al (2021) suggests that senior SpEdT might have be less open to learning environments that integrate technology. In contrast to younger teachers, older teachers generally had lower confidence in their technological abilities. This aligns with the findings of Salleh et.al (2019), who observed that younger special education teachers were more likely to incorporate modern technologies into their teaching, while older teacher preferred traditional methods.

Table 3: Sex of the Teachers from the Three Identified School

		Frequency	Percent
Sex			
	Male	13	17.8%
	Female	60	82.2%

In the data presented in table 3, a significant majority of participants were female. Out of 73 teacher respondents, 60 were female, making up 82.2%, while 13 were male, constituting 17.8%. This data implies a predominance of women in the educational workforce and indicates a significant underrepresentation of men in education settings. This distribution might have reflected broader trends in education, particularly in the SIE program, where women frequently outnumber men across various grade levels. The unequal number of male and female teachers in the school could have affect workplace dynamics, role modeling for learners, and the diversity of perspectives in the educational environment.

A study by Sinaga et.al (2019) found that female teachers often adopt nurturing and supportive teaching styles, which could have greatly benefitted all types of learners including LSENs. However, the shortage of male teachers might have limited the variety of teaching methods and perspectives available to these learners, potentially impacting their learning experiences. To address this, educational administrators should have hire more male teachers to offer a wider range of role models and teaching approaches. Both male and female teachers contribute to the holistic development of learners, so schools should have aim for a balanced number of male and female teachers.

According to Malan (2019), schools should have taken the initiative to recruit and retain more male teachers in SIE program to enrich the learning environment. This diversity would provide learners with different perspectives on how both men and women manage the classroom and school.

According to Fornelos (2022) male teachers often encountered challenges, including feelings of isolation and the need to navigate gender stereotypes. With his challenges with male teachers it was important that they would had supportive professional networks and mentorship programs so that they might have help them to be more flexible and effective so that learners could have benefits from the teacher competence as they manage an inclusive classroom.

Table 4: Civil Status of the Teachers from the Three Identified School

		Frequency	Percent
Civil Status			
	Single	18	24.7%
	Married	54	74.0%
	Widowed	1	1.4%

The data in table 4, shows that most of the respondents, accounting for 74.0% of the sample, were married individuals, indicating a significant portion of the workforce carrying family responsibilities. Additionally, 24.7% of the respondents were single, signifying a sizable portion of the workforce with different life priorities and needs. The data also shows that only 1.4% of the respondents were widowed, indicating a minority representation within the sample. The data implies workforce diversity among married teachers, who prioritize both family matters and career development. Single teachers might have focus on career development and social engagement, while the small percentage of widowed respondents might have required emotional and mental health support to adapt more effectively to modern teaching methods. This civil status profile had implications for shaping workplace policies, employee support systems, and organizational culture within these educational settingsThe distribution of civil status within the workforce significantly influences workplace dynamics and policy formulation. A study by (Erden et al., 2023) highlights the importance of accommodating family responsibilities in workplace policies, noting that married employees often require flexible working arrangements to manage their dual roles effectively. According to (Zabala et al., 2018) emphasizes that single employees might have had different priorities and needs, advocating for tailored support systems to better plan for a better career path and family life in the future. A report by the International Labor Organization (2023) underscores the necessity of inclusive policies that consider various life stages, including the challenges widowed individuals face, despite their minority representation. The absence of categories such as divorced or separated in workforce surveys, as noted by (Tašner et al., 2017) limits the understanding of workforce dynamics and suggests the need for more comprehensive data collection. Overall, these studies collectively indicate that a nuanced understanding of civil status was essential for shaping effective workplace policies and fostering a supportive organizational culture.

Table 5: Highest Educational Attainment of the Teachers from the Three Identified School

		Frequency	Percent
Highest Educational Attainment			
	College Graduate	8	11.0%
	Master Level	45	61.6%
	Master's Graduate	8	11.0%
	Doctoral Level	11	15.1%
	Doctoral Graduate	1	1.4%

The data presented in table 5, shows that most of the teacher respondents were in their Master's Level, comprising 61.6% (45 out of 73) of the sample, indicating a highly educated workforce with a strong emphasis on postgraduate qualifications. Combining all postgraduate categories, 89% of respondents had pursued education beyond a bachelor's degree, highlighting a very well-educated sample. A notable 16.5% of respondents were at the doctoral level or had completed a doctorate, suggesting a significant presence of highly specialized teachers. Both College Graduates and Master's Graduates each represent 11.0% of the sample, indicating some balance between those with bachelor's degrees and those who had completed master's programs. The data implies significant implications for professional development and educational quality, with a strong emphasis on advanced qualifications. Many teachers continue their master's level studies to better handle complex educational challenges, while those at the doctoral level focus on research and specialized knowledge, influencing curriculum development and innovative teaching methods. This reflects a commitment to continuous learning and improved pedagogical skills. The educational attainment data from the surveyed schools aligns with recent literature emphasizing the significance of advanced degrees in shaping educational environments and outcomes. Engida et al. (2024) also points to the complexity of the relationship between teacher qualifications and learner's performance, suggesting that while advanced degrees were prevalent, their impact on learner's functionality. According to Henry et al. (2022) the importance of educational attainment in shaping not only individual careers but also the broader educational landscape.

Table 6: Number of Years in Teaching LSENs of the Teachers from the Three Identified School

	Frequency	Percent
Number of Years in Teaching LSENs		
1-6	31	42.47%
7-12	14	19.18%
13-18	17	23.29%
19-24	9	12.33%
25-30	2	2.74%

Base from the data presented in table 6, It reveals that out from 73 teachers' respondents significantly indicates largest group consists of teachers with 1-6 years of experience, suggesting a significant proportion of relatively new teachers in the field of SIE program, while the second and third largest groups indicate a solid core of mid-career professionals. However, there's a declining percentage with increased experience, signaling potential turnover issues or field growth. The data implies a strong representation of early-career teachers in the SIE program, while the presence of experienced teachers was gradually declining. In this early professional stage, teachers in the SIE program need targeted professional development and support programs to effectively address the needs of all learners, including LSENs.The distribution of years of experience among teachers reveals important trends in the workforce, especially in managing all types of learners including LSENs. According to Dignath et al. (2022) early-career teachers bring fresh perspectives and innovative strategies, but they might have lacked the necessary depth of experience to effectively address complex learners needs. On the other hand, mid-career professionals typically had a wealth of practical knowledge and established pedagogical skills, which could have enhanced the learning environment for LSENs (Avramidis & Norwich, 2002). However, the decreasing percentage of teachers with more than six years of experience raises concerns about potential turnover and the sustainability of effective teaching practices in special education (Brown, 2020). Mentorship programs were important as experienced teachers could have significantly impacted the professional growth of neophyte teacher, fostering a collaborative culture that benefits learners (Leatherman & Niemeyer, 2005). Additionally, targeted professional development initiatives were essential to support both early-career and mid-career teachers, ensuring they were equipped to effectively meet the diverse needs of LSENs (Gülsün et al., 2023). These studies underscore the need for strategic approaches to workforce development in SIE programs, with a focus on mentorship, professional growth, and retention strategies to enhance educational outcomes for LSENs.

Table 7: Types of Classrooms of the Teachers from the Three Identified School

	Frequency	Percent
Types of Classrooms		
Self-contained	55	75.3%
Inclusive Setting	18	24.7%

The data show in table 7, that 75.3% of the teacher respondent was assigned and managing in a self-contained classroom where they were designed for specialized learning spaces for LSENs. 24.7% of classrooms were in inclusive setting. The data implies that most of the teacher's respondents were teaching in a classroom that provides well-rounded strategy demonstrates a keen awareness of the varied needs of different learners including LSENs, balancing specialized teaching with the advantages of inclusive education to individualize the learning environment according to each learners' specific needs. According to Yuwono and Okech (2021) emphasize that specialized classrooms could have significantly improve learning outcomes for all type of learners including LSENs by providing structured environments that address the needs of the learners in different developmental domains. When the LSENs was enrolled in a self-contained class the learner's development was fully nurtured because of the approach of teaching that was being applied to the learners that might have provide multiple benefits to the learners. Specialize classroom setting could have enhance cognitive functionality of the learners that would lead to skills development and make learners more functional in different developmental domains (Johnson & Golombek, 2018). A study by Adams and Torres (2022) inclusive setting could have enhance learners understanding about the differences of other individuals in the school. When the learner was learners in an inclusive setting learner should have be functional in different developmental domains so that the could have coop up with the different activities under the general education curriculum.

Inclusive settings could have led to improved self-esteem and social integration for all types of learners including LSENs Furthermore, effective collaboration of SpEd teacher and teaching could have address (Zach & Avugos, 2024). With the collaboration of the SpEdT and RevT it could have provided a holistic development to the learners because teachers were helping each other by collaborating their ideas and best practices to improved learner's functionality.

Table 8: Number of LSENs in Class of the Teachers from the Three Identified School

	Frequency	Percent
Number of LSENs in Class		
1-10	28	38.36%
11-20	29	39.73%
21-30	11	15.07%
31-40	15	6.85%

The data reveals presented in table 8, that most classrooms had 1-10 LSENs, making up 39.73% of the total, followed by 11-20 LSENs at 38.36%. Classrooms with 21-30 LSENs account for 15.07%, and those with 31-40 LSENs represent 6.85%. The data implies that teachers were managing more LSENs than the standard ratio set by DepEd Order No. 77, s. 2010, which states that there should have be 1 special education teacher for every 15 LSENs. This setup poses challenges for teachers in providing individualized educational interventions tailored to each learner's context. According to Undiyaundeye (2018) managing large numbers of learners, including LSENs, in both self-contained and inclusive classrooms could have be difficult and impacts the holistic development of learners. This challenge increases the demand for effective teaching strategies to meet diverse learning needs. Traya and Lopez (2023) emphasize that strong teacher knowledge and skills in applying inclusive practices were key to addressing concerns in an inclusive set up. Professional development was crucial, as teachers need ongoing training in pedagogical approaches to enhance the functionality and success of all learners, including LSENs (Talavera, 2022).

Table 9: Hours of Training /Seminars/Workshop of the Teachers from the Three Identified School

	Frequency	Percent
Hours of Training /Seminars/Workshop		
20-39	1	1.37%
40-59	7	9.59%
60-79	9	12.33%
80-99	27	36.99%
100-119	6	8.22%
120-139	4	5.48%
140-159	3	4.11%
160-179	4	5.48%
180-200	12	16.44%

Table 9 shows that there was a varied distribution of training hours among respondents. The most common range was 80-99 hours, representing 36.99% of respondents. A significant group, making up 16.44% of the total, had completed extensive training, ranging from 180-200 hours. In contrast, only a small proportion (1.37%) had received minimal training, which ranges from 20-39 hours. The majority of respondents (73.98%) had undergone 60 or more hours of training. The data implies a significant disparity in professional development opportunities or requirements across the group. A substantial portion of respondents had received more than the standard number of hours needed to apply for higher positions within DepEd. These results indicate that a significant number of teachers in this sample had benefited from substantial professional development related to the application of technology in SIE program. The professional development of SpEdT and RevT was crucial for effectively addressing the diverse needs of LSENs. Participating in training, seminars, and workshops significantly enhances teachers' competencies and confidence in managing inclusive classrooms.

The frequency and quality of these training sessions directly correlate with improved educational outcomes for LSENs, emphasizing the need for structured and accessible professional development programs within educational institutions (Adams & West, 2021). As the landscape of SIE program continues to evolve, the commitment to equipping teachers with the necessary skills through targeted training remains prominent. The commitment of teachers to enhancing their knowledge and skills in applying technology to manage learners under the SIE program had improved not only the learners' overall development but also the success of the program's implementation (Harlacher & Marx, 2022).

Table 10: Disability Type of Learners Taught of the Teachers from the Three Identified School

	Frequency	Percent	Rank
Intellectual Disability	38	52.1%	1
Autism Spectrum Disorder	29	39.7%	2
Orthopedic Disability	21	28.8%	3
Hearing Impairment	20	27.4%	4
Specific Learning Disabilities	13	17.8%	5
Visual Impairment	13	17.8%	6
Emotional and Behavioral Disturbance	11	15.1%	7
Others	8	11.0%	8
Attention Deficit Hyperactivity Disorder	7	9.6%	9
Gifted and Talented	2	2.7%	10

The data presented in table 10 shows that a wide range of disabilities among learners in three identified schools, each addressing diverse special educational needs. Intellectual Disability (ID) was the most common, affecting 52.1% of learners, indicating a strong focus on supporting cognitive challenges. Autism Spectrum Disorder (ASD) was the second most prevalent, affecting 39.7% of learners, highlighting the need for specialized strategies for those with autism. Orthopedic Disability (OD), affecting 28.8%, underscores the importance of physical accessibility and adapted physical education. Base from the date it implies that the top three disabilities likely demand the most resources and teacher training, suggesting a strong need for individualized education plans, adaptive technologies, and support for both cognitive and physical development. The schools had to offer a broad range of resources and support systems to meet the diverse needs of their learners. Research supports the importance of specialized approaches for different disabilities. Bougeard et al. (2021) found that between 2019 and 2021, developmental disabilities like ID and ASD showed significant prevalence patterns, with ASD affecting approximately 3.05% of children in 2021. This aligns with Friedman et al. (2018) findings, emphasizing the need for targeted teaching methods for learners with ASD to improve their academic and social outcomes. Similarly, Souza et al. (2020) stress the growing need for better physical accessibility for learners with OD. Gilmour et al. (2018) highlight the role of adaptive technologies in facilitating learning for LSENs, while De Bruin (2019) advocate for continuous teacher training to address the complex needs of LSENs in inclusive classrooms. Finally, UNICEF's 2023 global report calls for comprehensive support systems to ensure children with developmental disabilities had equal access to quality education.

B. Level Of Competency Of Teachers From The Three Identified Schools In Applying The Tpack Framework In Facilitating Learning For Learners With Special Educational Needs

Table 11 to Table 26 shows the teachers competence in applying the TPACK framework facilitating learning for all type of learners including LSENs. The TPACK framework, which had been translated as Technological, Pedagogical and Content Knowledge was an essential theoretical reference model in initial training and teacher professional development programs for the application of technology. Which consists of indicators of critical thinking, communication, collaboration and creativity (Sulistyarini et al.,2022). The TPACK framework had had a strong influence on research and practice in teacher education and professional development and inspired extensive research and scholarship (Morgan et al., 2018). It highlights how essential it was for teachers to had a thorough awareness of how these components work together to produce successful learning environments. Teachers that possess competency in the TPACK framework were able to choose relevant technologies that complement their pedagogical practices and the particular subject matter they were teaching.

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Table 11: Level of Competency of Teachers as to Technological Knowledge

		Mean	Std. Deviation	QD of the Mean
1	I can learn technology easily.	3.2603	.62422	Highly Competent
2	I can easily solve some of the technical problems I encounter.	2.8904	.61377	Competent
3	I know how to seek technology help.	3.2055	.68635	Competent
4	I have sufficient knowledge and experience with the most recent technologies.	2.9863	.63450	Competent
5	I can help my friends in their use of different technologies.	3.0548	.72439	Competent
6	I use different technologies regularly for different purposes (i.e., communication, typing, internet).	3.3836	.61532	Highly Competent
7	I try different technologies in my free time.	3.1370	.80476	Competent
	Grand Mean	3.1311	.54124	Competent

Range: 1.00-1.74 “Not Competent”, 1.75-2.49 “Less Competent”, 2.50-3.24 “Competent”, 3.25-4.00 “Highly

The results of the teachers' TK competency were shown in Table 11. It indicates that teachers were competent in acquiring new skills and applying technology into their teaching practices, with a grand mean of 3.1311. Item number 2 had a mean score of 2.8904, item number 4 had a mean score of 2.9863, and item number 5 had a mean score of 3.0548. These items represent the three lowest mean scores, but were still described as "competent" in the qualitative description of the mean. The data implies that although teachers feel competent, they might have lacked the confidence and skills needed to manage technical issues, which were crucial for the smooth integration of technology in an inclusive setting. Additionally, teachers might have not be fully up to date with the latest technological developments, which could have hindered their ability to implement developmentally appropriate practices for managing learners. This indicates a need for more collaborative practices among teachers and reflects a modest level of confidence in peer support. With the rapid advancement of technology in society, it’s clear that technology had a significant impact on SIE program. Teachers now had the opportunity to use a wide range of teaching and learning practices. Basic ICT skills, such as operating computers, using software, and navigating the internet, had influenced how learners use social media for information, entertainment, social connections, and education (Supardi et al., 2021). Specifically, the Internet and the World Wide Web offer both teachers and learners a platform to enhance their technology skills, making learner-focused teaching practices more feasible (Bansal, 2023). However, the application of technology into SIE programs had been hindered by a lack of confidence in using technology to help learners become more functional (Seufert et al., 2020). Teachers need to address technical issues—such as hardware failures, connectivity problems, or software glitches—quickly, so they could have focus on supporting and assessing learners' progress during the teaching process. Teachers who were unsure about solving technical problems might have hesitate to use technology in their classrooms, fearing they won’t be able to handle any issues that arise. Moreover, the rapid pace of technological change could have be overwhelming, as teachers might have struggle to keep up with new devices and applications. This issue was worsened by teachers' busy schedules, which leave little time to learn and apply technological skills. Cultural factors within schools, such as limited support for taking risks, might have also discourage teachers from troubleshooting.

Although collaboration was important for knowledge sharing and skill development, these challenges might have prevented teachers from feeling confident in supporting each other. To address this, teachers need to improve their technological proficiency, and it's clear they require professional development programs to help them effectively use technology in SIE programs. Amhag et al. (2019) suggest that focused professional development could have greatly improve teachers' technological skills and their ability to integrate technology into their teaching. Schools with SIE programs could have help teachers fully implement technology by providing training and support, ultimately enhancing the learning experiences of LSENs. Studies had shown that teachers who were comfortable using technology in the classroom were more likely to did so effectively, leading to greater learner engagement and development (Jung & Leftwich, 2020).

Table 12: Level of Competency of Teachers as to Content Knowledge

		Mean	Std. Deviation	QD of the Mean
1	I have sufficient knowledge in my field.	3.1918	.49039	Competent
2	I know basic concepts such as definitions in my field.	3.2055	.49886	Competent
3	I understand the structure (organizations) of topics of content I teach.	3.1781	.50942	Competent
4	I can present the same subject matter at different levels.	3.1233	.62239	Competent
5	I can explain background details of concepts and definitions in my field.	3.1370	.53528	Competent
6	I have adequate knowledge in explaining relations among different concepts on the subject matter.	3.1370	.56063	Competent
7	I can make connections with the content I teach and daily life.	3.2466	.49387	Competent
	Grand Mean	**3.1742**	**.43268**	**Competent**

Range: 1.00-1.74 "Not Competent", 1.75-2.49 "Less Competent", 2.50-3.24 "Competent", 3.25-4.00 "Highly Competent

The data presented in the table 12 shows that the average scores for all items fall within the "Competent" qualification range suggesting satisfactory performance in CK of the teachers. However, the bottom three items - Item 5 with the mean score of 3.1370, Item 6 with the mean score of 3.1370, and Item 7 with the mean score of 3.2466. The items imply challenges in effectively explaining background details, relating concepts across subject matter, and connecting content to daily life. According to Pope (2018) though teachers had mastery of the subject matter, they still face challenges in integrating the background information of the subject matter while developing other developmental domains. Teachers should have balanced their mastery of the subject matter while addressing the developmental needs of their learners. Managing all types of learners, including LSENs, in an inclusive setting requires more than just delivering content; it also involves integrating that knowledge with strategies that promote the development of other domains, such as social, emotional, physical, and cognitive skills. Content knowledge alone was not enough; teachers had to adapt their instruction to ensure that lessons foster growth in areas beyond academic learning, such as collaboration, emotional regulation, or fine motor skills. Teachers with strong content knowledge were more effective in engaging learners and promoting a deeper understanding of the subject matter (Malik et al., 2019). For inclusive practices to be effective, teachers had to design learning experiences that not only convey subject knowledge but also nurture other critical developmental domains, ensuring holistic growth for their learners. According to Ning et al., (2020), a teacher's mastery of the content was crucial for the overall development of learners. When teachers had a deep understanding of the subject they teach, it becomes easier for them to design effective lessons.

They could have presented the lesson in a clear and engaging way, making it simpler for learners to grasp. In teaching all types of learners including LSENs it was important that teachers could have integrate the subject that they teach to the other subject area. Teachers need to improve the way they deliver interdisciplinary instruction. By integrating one subject with another, it helps learners view lessons from different perspectives and apply their learning in various life situations. An interdisciplinary approach to teaching a particular subject could have had a significant impact on the overall development and functionality of learners, helping them fully integrate into a progressive society. Teachers who had a strong understanding of the subject matter could have make learners competent enough to apply theoretical learning to real-world experiences (Ball et al., 2008). Strong content knowledge allows teachers to break down complex topics into smaller, manageable parts, helping learners, especially those with cognitive challenges, build their understanding step by step. According to Greefrath et al. (2021) schools should have encourage a collaboration to strengthen teachers' abilities in explaining content and connecting it to learners' daily experiences. Collaboration between teachers and other professionals who were experts in the fields they were teaching could have enhanced teachers' abilities to deliver content in a meaningful way and make it relevant to learners' development. In the SIE program, collaboration between teachers and other members of the multidisciplinary team helps them address the needs of their learners and make subject matter more accessible and applicable.

For LSENs, learners require content to be taught in ways that were closely tied to their real-world experiences to support their understanding and engagement. By working together with other teachers, specialists, and parents, SpEdT and RevT could have develop strategies to connect academic content to practical, everyday situations of the learner. Base form the research of Schukajlow et al. (2018) they indicate that continuous training focusing on content knowledge significantly boosts teachers' confidence and the quality of their instruction.

Persistent support and access to resources could have able teachers to effectively convey foundational information and establish connections across disciplines. Collaboration also allows teachers to share different perspectives and teaching methods that could have improve their ability to explain content clearly. For instance, RevT might have share effective subject-specific strategies, while a SpEdT contributes insights into how to adapt these strategies for learners with learning challenges. This exchange of knowledge strengthens a teacher's ability not only to explain content but also to adapt it based on the diverse needs and life experiences of their learners.

Table 13: Level of Competency of Teachers as to Pedagogical Knowledge

		Mean	Std. Deviation	QD of the Mean
1	I can use different approaches to teach	3.2055	.49886	Competent
2	I can select appropriate teaching styles for students from different backgrounds	3.2740	.55927	Highly Competent
3	I can use a variety of tools (approaches) to assess students' learning	3.2329	.51426	Competent
4	I consider students' backgrounds, interest, motivation, and other needs in my teaching	3.4247	.52488	Highly Competent
5	I can plan individual and group learning activities effectively	3.2329	.54059	Competent
6	I have knowledge in different pedagogies of teaching and learning	3.1370	.45077	Competent
7	I have knowledge in different components of teaching (i.e., instruction, assessment)	3.6849	3.50744	Highly Competent
	Grand Mean	3.3131	.61706	Highly Competent

Range: 1.00-1.74 "Not Competent", 1.75-2.49 "Less Competent", 2.50-3.24 "Competent", 3.25-4.00 "Highly Competent

Based on the data presented in table 13, teachers were 'Highly Competent" with the grand mean of 3.3131 in terms of PK. The bottom 3 items on the evaluation were as follows: Item 6, with a mean score of 3.1370, Item 1 received a mean score of 3.2055, and Items 3 and 5 were tied, both receiving a mean score of 3.2329. The data implies that both SpEdT and RevT had knowledge of various teaching and learning pedagogies. Furthermore, they could have effectively planned both individual and group learning activities, as well as use a variety of tools to assess learner progress. Researchers had stressed the significance of including a variety of teaching methods and approaches to improve teachers' skills. According to a study conducted by Kind and Chan (2019), effective teacher training programs should have offer opportunities for future teachers to participate in different instructional techniques and adjust them to suit various learners. In a similar vein, Gómez and Aldecoa (2021) emphasize the importance of ongoing professional development that concentrates on broadening teachers' range of teaching strategies to meet individual learners' requirements. Assessment tools and techniques were crucial for informed decision-making and targeted instruction. According to a systematic review by Gess- Suglo et al. (2023), formative assessment could have significantly improved learner's achievement when implemented effectively. In addition, a study by König et al. (2020) found that digital assessment tools could have enhance teachers' assessment literacy and provide valuable data for instructional planning. It was crucial to had effective lesson planning and activity design to create engaging and meaningful learning experiences. In a study by Susanto et al. (2019), it was found that a professional development program focused on lesson planning improved teachers' ability to design lessons that align with learning objectives and learners needs. Additionally, Loughran (2019) discovered that collaborative lesson planning could have promote professional learning communities and enhance teachers' pedagogical knowledge. "Strategies for meeting the needs of diverse leaners include customizing instruction and offering personalized learning opportunities. Neumann et al. (2018) stress the significance of differentiation in the classroom and offer practical approaches for putting it into practice. Furthermore, Singh & Alshammari (2021) examined the effectiveness of personalized learning technologies and discovered that when used well, they could have enhanced learner's engagement and success. Engaging in reflective practice and participating in professional learning communities were essential for ongoing professional growth and development. Pascual et al. (2021) emphasizes the importance of reflection-in-action and reflection-on-action for improving teaching practice. Furthermore, Nilsson and Karlsson (2018) found that participation in professional learning communities could have led to improved learners learning outcomes and enhanced teacher collaboration.

Table 14: Level of Competency of Teachers as to Pedagogical Content Knowledge

		Mean	Std. Deviation	QD of the Mean
1	I can select teachable content of the subject matter appropriate to students' level.	3.2603	.55346	Highly Competent
2	I can teach the same subject matter to students at different levels.	3.1644	.57768	Competent
3	I can adjust my teaching according to level of ease and difficulties with learning of specific subject matter.	3.1781	.58553	Competent
4	I can use different methods and approaches to represent specific content.	3.0822	.52051	Competent
5	I can generate alternative teaching approaches according to students' levels.	3.0959	.55689	Competent
6	I have sufficient knowledge in transforming students' misconceptions.	3.0274	.66610	Competent
7	I can use analogies, examples, and demonstrations to support students' learning.	3.2329	.51426	Competent
	Grand Mean	3.1487	.44888	Competent

Range: 1.00-1.74 "Not Competent", 1.75-2.49 "Less Competent", 2.50-3.24 "Competent", 3.25-4.00 "Highly Competent

The table 14 shows the teachers were "Competent" with the grand mean of 3.1487 in terms of their PCK. The bottom three items were the item 6 with a mean score of 3.0274, item 5 with the mean score of 3.0959, and item 4 with the mean score of 3.0822. Despite being the lowest-scoring items, all three still indicate competent. The data implies that adapting alternative teaching approaches and using different methods to represent content base form the learner's needs might have be the challenging aspect for SpEdT and RevT. A research conducted by Jang and et.al in 2019 investigated how teachers' pedagogical content knowledge was related to their instructional practices. They discovered that teachers who possess stronger pedagogical content knowledge were more inclined to involve learners in higher-order thinking and utilize a range of teaching strategies. This underscores the significance of enhancing teachers' pedagogical content knowledge to enhance their effectiveness in teaching. Meanwhile, König et al. (2020) studied the influence of teacher education programs on the development of pedagogical content knowledge. Their findings revealed that programs integrating content knowledge and pedagogical knowledge were more successful in cultivating teachers' pedagogical content knowledge than programs that addressed these areas separately. This implies that teacher education programs should have prioritize the integration of content and pedagogy for better teacher preparation. Santos and Castro (2021) conducted a study on the correlation between teachers' proficiency in teaching specific subjects and their confidence in teaching those subjects. Their research showed that teachers with a solid grasp of how to teach their subjects tend to had greater confidence in their teaching abilities. Furthermore, this confidence was associated with the use of more effective teaching techniques. This implies that enhancing teachers' expertise in teaching not only enables them to articulate concepts and address misunderstandings but also bolsters their confidence in teaching. Shepard et al. (2023) formulated a framework for comprehending the various facets of teaching knowledge, encompassing subject knowledge, learner's knowledge, teaching method knowledge, and assessment knowledge. This framework provides a valuable means of conceptualizing and assessing teachers' comprehension of how to effectively teach specific subjects. Additionally, Malik et al. (2023) delved into the significance of pedagogical content knowledge in teacher training programs. They discovered that programs offering opportunities for teachers to apply and hone their pedagogical content knowledge in real teaching settings were more successful in nurturing their proficiency.

Table 15: Level of Competency of Teachers as to Technological Pedagogical Knowledge

		Mean	**Std. Deviation**	**QD of the Mean**
1	I can use technology to assess student's learning.	3.3014	.63868	Highly Competent
2	I can use technology to identify individual differences among students.	3.2329	.67742	Competent
3	I can use technology to advance my teaching and students' learning.	3.2055	.62269	Competent
4	I can use technology to bring students' individual differences (learning preferences, content background, academic level) into the classroom	3.2055	.62269	Competent
5	I can use technology to enrich different components (i.e. lecturing, examples, and assessment) of teaching Activity.	3.2192	.60660	Competent
6	I can use technology to engage students with content.	3.2055	.62269	Competent
7	I can use technology to generate alternative approaches to teaching components (i.e. teaching, assessment, presentation, motivation).	3.2055	.62269	Competent
	Grand Mean	**3.2250**	**.57386**	**Competent**

Range: 1.00-1.74 "Not Competent", 1.75-2.49 "Less Competent", 2.50-3.24 "Competent", 3.25-4.00 "Highly Competent

The results on teachers' TPK competency were shown in Table 8. It reveals that teacher's response had a grand mean of 3.2250 meaning teachers were competent in TPK. The item, 3, item 4, and item 6 got the same mean of 3.2055 and had a qualitative description of the mean "Competent". The data implies that teacher might have find it difficult to use technology in ways that recognize and benefit from the wide range of learning styles and backgrounds of their learners. Their capacity to establish a stimulating and adaptable learning environment that encourages learner's involvement and motivation could have be affected by this lack of confidence. Additionally, a lot of teachers say they don't feel ready to incorporate technology into their lessons. Challenges of applying technology included technology malfunctions and lack of teacher and learner's technological knowledge (Lachner et al., 2019). A study of Jung and Ottenbreit-Leftwich (2019) found that teachers frequently lack the assistance and training needed to use technology in ways that improve instruction. A lack of professional development might have cause teachers to be hesitant and anxious about using technology to fulfill the requirements of different types of learners. Moreover, a lack of professional development opportunities that concentrate exclusively on the use of technology for SpEdT was a common reason given by numerous teachers who feel unprepared to apply modern technologies into their teaching practices. For that reason, the field of educational technology should have keep moving in directions that were responsive to the needs of a global educational technology community in terms of topics, resources, contexts, formats, and accessibility as professionals in the field struggle with this new reality in a world that calls for more focused guidance for our professionals globally. Allman et al. (2023) emphasize the importance of technology in enhancing assessment strategies. Therefore, teacher training programs should have included technology education in their curricula rather than just concentrating on making sure that learners could have utilize it effectively. Teachers should have be given the chance to create technology-enhanced curriculum materials in order to strengthen their self-efficacy attitudes on technology application (Dikmen & Demirer 2022). Furthermore, the research by Singh et al. (2021) highlights that the technology use could have had a substantial impact on learners' engagement and learning outcomes. An efficient use of technology in the classroom promotes learner's engagement and enhances academic performance by offering interactive learning opportunities, individualized instruction, teamwork chances, prompt feedback, and the development of practical skills.

Table 16: Level of Competency of Teachers as to Technological Content Knowledge

		Mean	Std. Deviation	QD of the Mean
1	I can use technology to present the content in different ways.	3.2603	.57801	Highly Competent
2	I can use technology to enrich the content.	3.2329	.61284	Competent
3	I can use technology to demonstrate unobservable facts, concepts, and principles of the content.	3.0959	.60471	Competent
4	I can use technology to access additional resources about content that may otherwise not be available.	3.2055	.59997	Competent
5	I can use technology to provide students with opportunities in exploring content by themselves at their own individual pave.	3.0548	.59839	Competent
6	I can use technology to support students in deeper inquiry about the content, concepts, and relationships with other subject matters	3.1096	.59071	Competent
7	I can use technology in teaching to provide different forms of content.	3.0959	.60471	Competent
	Grand Mean	**3.1507**	**.52913**	**Competent**

Range: 1.00-1.74 "Not Competent", 1.75-2.49 "Less Competent", 2.50-3.24 "Competent", 3.25-4.00 "Highly Competent

Table 16 shows that the teachers "competent" in their TCK with the grand mean of 3.1507. item 5 with the mean score of 3.0548, item 7 and item 3 had the same mean score of 3.0959 got the lowest means score. The data implies difficulties in fostering independent learning through technology and highlights challenges in presenting abstract ideas using visual aids. This suggests a lack of competence in applying technology to present content in different forms. These results show that, while most teachers feel comfortable utilizing technology, there were several areas where they lack confidence and proficiency. Given the rapid advancement of technology and the ever-increasing demands for integrating technology into instruction, teachers had been under pressure to stay up to date with applying technology and create instructional application of technology (Dong et al.,2020). learners were often more tech-savvy than teachers, and teachers who were raised without access to these devices might have find themselves intimidated by them. This might have result in an unwillingness to consider new possibilities and a tendency to stick to familiar teaching methods. Consequently, with accessible and interesting learning opportunities, technology could have help LSENs learn unobservable facts, concepts, and principles. With that, the teacher should have integrated technology like assistive technology. All types of learners including LSENs could have access content successfully through assistive technologies (ATs). The study by Mishra (2019) proved that the application of ATs was essential in the learning process for LSENs. These learners struggle to complete tasks on their own, thus teachers frequently include ATs into their lesson to support the LSENs. With the use of such technology, LSENs could have accomplish things more effectively, and their functionality in the school was improved. It improves interaction between teachers and LSENs, enabling more effective instruction of ideas. And with the application of ATs in managing LSENs might have get support in enhancing their lives to increase their development in different developmental domains. In addition, through the use of an engaging environment made possible by augmented and virtual reality technologies, learners could have better understand challenging concepts by investigating them in a three-dimensional setting (Moreno et al., 2019). Hwang and Chang (2020) research gives more validity to this, showing that learners might have interact more meaningfully with the topic by using technology to enable deeper inquiry and content development. The results also align with the research of Alshammari et al. (2023), which emphasizes that teacher confidence with technology had a big impact on how well they could have taught a subject. Teachers that had high TCK were more likely to use cutting edge teaching techniques that include learners in the learning process. Moreover, teachers should have embraced these new technologies with optimistic caution, carefully considering potentials balanced against security, privacy, and other concerns (Seaman & Seaman, 2023). It was knowing the material they were teaching, teachers with good TCK also know how to successfully use technology in their lesson plans. Through this application, they could have use innovative methods of teaching to give learners a greater variety of classes. A teacher who was comfortable with multimedia tools, for example, might have make exciting presentations that clarify difficult ideas or use web resources to let learners go further into a subject. Technology had to be used in education as well as other disciplines due to the habits of the new generation, known as digital natives, and the necessity for human power in the information age.

Table 17: Level of Competency of Teachers as to Technological Pedagogical Content Knowledge

		Mean	Std. Deviation	QD of the Mean
1	I can use technology in teaching the specific content within the defined pedagogical approach in a given context.	3.0685	.56097	Competent
2	I can use technology in such a way that students feel its positive impact in their learning of specific subject matter.	3.2055	.57636	Competent
3	I can use technology to organize my teaching and students' learning specific content.	3.3014	.56972	Highly Competent
4	I can use technology to bring real-life experiences, examples, and analogies about specific content	3.3014	.54480	Highly Competent
5	I can use technology to identify learners' individual differences on understanding of the content	3.1918	.59296	Competent
6	I can use technology to make specific subject matter comprehensible by students from different backgrounds	3.1370	.58488	Competent
7	I can use technology to provide opportunities to each student in the classroom to contribute to learning activity related to specific content	3.1781	.56131	Competent
	Grand Mean	3.1977	.49809	Competent

Range: 1.00-1.74 "Not Competent", 1.75-2.49 "Less Competent", 2.50-3.24 "Competent", 3.25-4.00 "Highly Competent

Table 17 shows the results of the TPACK competency of SpEdT and RevT. The date revealed that teachers were "Competent" having a grand mean of 3.1977. The following competencies had the lowest mean scores: item 1 with mean score of 3.0685, item 6 with the mean score of 3.1370, and item 5 mean score of 3.1918. These results imply that incorporating technology into teaching practices could have be difficult for teachers at times, especially when it comes to connecting up these technological resources with well-established pedagogical approaches that had been modified for particular subject areas. This challenge results from the requirement to comprehend a variety of technology tools and know how to use them to improve teaching methods and accomplish learning goals. Lack of engagement and pedagogical competence could have result from teachers not making this connection, since technology might have not supported the desired learning outcomes or might have even serve to distract learners instead of assist in their learning. Several studies show that teachers face a difficult task when applying technology into their lesson plans. While information and communications technology (ICT) applications might have be successful in isolation, this did not guarantee equivalent outcomes in actual classroom settings. Teachers frequently struggle to incorporate technology into their teaching methods. Recent studies had delved deeper into the significance of TPACK in the field of education. Mishra (2019) stressed that effective application of technology in teaching relies on a sophisticated combination of content, pedagogy, and technology knowledge. Meanwhile, Harris and Hofer (2020) discovered that professional development programs concentrating on TPACK could have notably enhance teachers' capacity to utilize technology in their classrooms. They found that teachers with higher TPACK were more adept at adjusting to the challenges of remote teaching. Correspondingly, Tondeur et al. (2019) stated that prospective teachers who received specific TPACK training exhibited a greater sense of confidence and competence in integrating technology into their teaching methods and also the importance of lesson study practices and ICT-enhanced lesson enactment in developing pre-service teachers' TPACK competencies, including their ability to use technology to organize content and provide real-life examples (Chai et al., 2018). These findings align with the competency levels outlined in Table 10, indicating that ongoing endeavors to cultivate teachers' technological pedagogical content knowledge were essential for effective 21st-century education. Furthermore, Taopan et al., (2020) said that TPACK was a useful framework for considering the knowledge that teacher requires and possible ways to acquire it in order to incorporate technology into the classroom. Furthermore, the kind of professional development and training programs that were created for teachers might have be impacted by the adoption of TPACK as a framework for assessing teaching knowledge

Table 18: Summary Table for Teachers Competency in TPACK framework

	Mean	Std. Deviation	Rank
Pedagogical Knowledge	3.3131	.61706	1
Technological Pedagogical Knowledge	3.2250	.57386	2
Technological Pedagogical Content Knowledge	3.1977	.49809	3
Content Knowledge	3.1742	.43268	4
Technological Content Knowledge	3.1507	.52913	5
Pedagogical Content Knowledge	3.1487	.61706	6
Technological Knowledge	3.1311	.54124	7

Table 18 summarizes the TPACK framework competency levels of teachers, highlighting areas in which teachers might have benefit from additional training. With a mean score of 3.1311, Technological Knowledge was the lowest-ranked competence. With a mean score of 3.1487, Pedagogical Content Knowledge ranks in second from the bottom. Lastly, with a mean score of 3.1507, Technological Content Knowledge ranks in third from the bottom. There were a number of interrelated factors that lead to the lowest mean scores for TK among teachers. Compared to pedagogical and subject knowledge, teachers frequently receive less training and professional development that was especially focused on technology knowledge. Teachers struggle to develop their TK to the same degree as their PK and CK without sufficient training opportunities (Kind et al., 2019). Additionally, curriculum that were firm and had a strong focus on standardized testing might have limit teachers' abilities to experiment with and use technology into their teaching. According to Susanto (2019), teachers who were under pressure to concentrate on test preparation might have give content delivery a higher priority than the investigation of modern teaching strategies, such as the use of technology. Their ability to acquire new technological information and abilities might have be hindered by this focus. TPACK Framework should have significantly improve teachers' technological proficiency and confidence. Aliyu (2022) suggests that formalized instruction be provided, covering both technical proficiency and instructional techniques for incorporating technology into the curriculum.

This method could have assisted teachers in making a transition from incorporating technology into their lesson plans to using it as a modification. Previous research had shown that in order to successfully present and formulate the content to learners, teachers need to be knowledgeable about upgrading technology-integrated teaching approaches. For this reason, utilizing technology-application in teaching teachers professional development programs requires the advancement of the TPACK framework. Furthermore, there was an increasing amount of research suggesting that personalized rewards programs enhance the standard of professional teacher development. (Yao, 2022). The TPACK framework also supports SIE programs because it provides learners with a better learning environment and helps them become more functional in their various development areas (Alarba et al., 2023).

C. Test Of Significance Of The Relationship

Table 19: Association Between the Respondents Level of TPACK Framework Competencies and Their Age

		Age	Decision on H_0
Technological Knowledge	Pearson Correlation	-.117	
	Sig. (2-tailed)	.323	Cannot Reject H_0
	N	73	
Content Knowledge	Pearson Correlation	.009	
	Sig. (2-tailed)	.941	Cannot Reject H_0
	N	73	
Pedagogical Knowledge	Pearson Correlation	-.092	
	Sig. (2-tailed)	.436	Cannot Reject H_0
	N	73	
Pedagogical Content Knowledge	Pearson Correlation	.050	
	Sig. (2-tailed)	.676	Cannot Reject H_0
	N	73	
Technological Pedagogical Knowledge	Pearson Correlation	-.115	
	Sig. (2-tailed)	.332	Cannot Reject H_0
	N	73	
Technological Content Knowledge	Pearson Correlation	-.053	
	Sig. (2-tailed)	.654	Cannot Reject H_0
	N	73	
Technological Pedagogical Content Knowledge	Pearson Correlation	-.133	
	Sig. (2-tailed)	.263	Cannot Reject H_0
	N	73	

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

*. Correlation is significant at the 0.05 level (2-tailed).

The date presented in table 19 reveals that there was no significant relationship of between age of the SpEdT and RevT towards their TPACK framework competency. According to Tondeur et al. (2019) age did not strongly predict teachers' technology application in their teaching practice. According to Özgür (2020) reported no significant relationship between age and TPACK in Spanish teachers. While the study of Spiteri and Rundgren (2018), argue that younger teachers might have excel in technological knowledge, the overall consensus emphasizes that factors such as experience, professional development, and institutional support had a greater impact on TPACK development than age.

Table 20: Association Between the Respondents Level of TPACK Framework Competencies and Their Sex

	Pearson Chi-Square Coefficient	df	P-value (2-sided)	Decision on H_0
Technological Knowledge	9.711	15	.838	Cannot Reject H_0
Content Knowledge	22.736	12	.030	Reject H_0
Pedagogical Knowledge	9.899	12	.625	Cannot Reject H_0
Pedagogical Content Knowledge	10.292	12	.590	Cannot Reject H_0
Technological Pedagogical Knowledge	10.936	12	.534	Cannot Reject H_0
Technological Content Knowledge	19.265	12	.082	Cannot Reject H_0
Technological Pedagogical Content Knowledge	16.998	30	.973	Cannot Reject H_0

Out of the seven competencies analyzed in Table 20, only CK shows a significant association with the respondents' sex with the P-value of .030. Several recent studies had explored the relationship between gender and TPACK framework competencies, with differing results. According to Alawadh et al. (2019) found no significant gender differences in pre-service teachers' TPACK framework competency, consistent with most aspects of their study. However, a study by Gómez and De Aldecoa (2021) suggested that while specific TPACK components might have show gender differences, the overall framework often did not reveal significant disparities. Similarly, Irwanto et al. (2022) noted that male teachers tended to score higher in TK, while female teachers demonstrated stronger PK, indicating that gender impacts specific TPACK framework components rather than the overall competency. Yelken et al. (2019) found no significant gender differences in TPACK among Pakistani secondary school teachers, supporting the current study's findings for most aspects. According to Arya et al. (2020) teachers' TPACK self-efficacy had no significant gender differences, aligning with the overall TPACK results in this study. Furthermore, Alaboudi & Alharbi (2020) explored gender differences among Saudi teachers and found that while CK varied, other TPACK components remained consistent across genders. This emphasizes that gender might have influence specific aspects of TPACK but did not necessarily affect the overall competency of teachers in applying technology into their pedagogical practices. However, the studies stressed the importance of continuous professional development for all teachers, regardless of gender. Collectively, these studies suggest that while gender might have occasionally influence specific TPACK components, overall TPACK competencies were generally not significantly affected by gender, aligning with the findings presented in table 20.

Table 21 Association Between the Respondents Level of TPACK Framework Competencies and Their Civil Status

	Pearson Chi-Square Coefficient	df	P-value (2-sided)	Decision on H_0
Technological Knowledge	16.998	30	.973	Cannot Reject H_0
Content Knowledge	25.132	24	.399	Cannot Reject H_0
Pedagogical Knowledge	28.616	24	.235	Cannot Reject H_0
Pedagogical Content Knowledge	52.593	24	.001	Reject H_0
Technological Pedagogical Knowledge	40.892	24	.017	Reject H_0
Technological Content Knowledge	20.651	28	.840	Cannot Reject H_0
Technological Pedagogical Content Knowledge	34.525	24	.076	Cannot Reject H_0

Presented in Table 21 the association between PCK and civil status of the teacher respondents had the P-value of .001 and TPK and civil status of the teacher respondents had the P-value .017. With the data presented, it implies that there was a significant relationship to the PCK and TPCK toward the civil status of the the SpEdT and RevT.

These findings align with Xiaoqing et al. (2024), who emphasize that teachers' TPACK understanding could have vary based on personal factors such as marital status. Their research suggests that civil status could have influence how teachers integrate technology and apply pedagogical practices. Similarly, Sastria (2023) found a strong correlation between TPACK and self-efficacy, reinforcing that a solid grasp of PK and CK positively affects technology application. This supports the idea that demographic factors like civil status could have play a role in teachers' professional development and how they apply TPACK framework in the classroom, impacting their teaching efficacy. Akyuz (2022) also highlighted how self-efficacy beliefs drive technology adoption in education, further linking personal circumstances to teaching outcomes.

Table 22: Association Between the Respondents Level of TPACK Framework Competencies and Their Highest Educational Attainment

	Pearson Chi-Square Coefficient	df	P-value (2-sided)	Decision on H_0
Technological Knowledge	53.423	60	.713	Cannot Reject H_0
Content Knowledge	32.960	48	.952	Cannot Reject H_0
Pedagogical Knowledge	40.813	48	.760	Cannot Reject H_0
Pedagogical Content Knowledge	48.198	48	.465	Cannot Reject H_0
Technological Pedagogical Knowledge	32.609	48	.956	Cannot Reject H_0
Technological Content Knowledge	62.059	56	.269	Cannot Reject H_0
Technological Pedagogical Content Knowledge	37.676	48	.858	Cannot Reject H_0

Table 22 shows the results of the association between the TPACK competency of teachers and their educational attainment. Based on the data presented, it reveals that none of the components of the TPACK framework had a significant relationship with teachers' educational attainment. Whether teachers were at the master's level or had only completed their bachelor's degree, this did not affect their competency in applying technology to manage different learners, including LSENs, in the SIE program. This implies that during the teachers' undergraduate studies or while they were already teaching, higher education institutions and educational sectors provided opportunities for teachers to become competent in applying technology to adapt instruction to best fit the individual needs of learners.

This aligns with Li et al. (2022), who found that practical teaching experience, rather than formal education, plays a key role in developing TPACK competencies. While education provides a foundation, hands-on classroom experience was crucial for applying technology, pedagogy, and content knowledge. Prasojo et al. (2020) similarly noted that teachers with different educational backgrounds exhibit comparable TPACK skills, emphasizing that educational attainment was not a significant predictor of proficiency in integrating technology.

Further, Windianingsih et al. (2023) highlighted that professional development programs could have bridge gaps in TPACK, suggesting that continuous training, rather than formal education alone, enhances teachers' technology application skills. These findings suggest that targeted professional development might have be more effective in improving TPACK competencies than relying solely on educational qualifications.

Table 23: Association Between the Respondents Level of TPACK Framework Competencies and Their Number of Years Teaching LSENs

		Number of Years Teaching LSENs	Decision on H_0
Technological Knowledge	Pearson Correlation	-.155	
	Sig. (2-tailed)	.190	Cannot Reject H_0
	N	73	
Content Knowledge	Pearson Correlation	-.041	
	Sig. (2-tailed)	.728	Cannot Reject H_0
	N	73	
Pedagogical Knowledge	Pearson Correlation	-.122	
	Sig. (2-tailed)	.303	Cannot Reject H_0
	N	73	
Pedagogical Content Knowledge	Pearson Correlation	-.048	
	Sig. (2-tailed)	.687	Cannot Reject H_0
	N	73	
Technological Pedagogical Knowledge	Pearson Correlation	-.176	
	Sig. (2-tailed)	.136	Cannot Reject H_0
	N	73	
Technological Content Knowledge	Pearson Correlation	-.093	
	Sig. (2-tailed)	.435	Cannot Reject H_0
	N	73	
Technological Pedagogical Content Knowledge	Pearson Correlation	-.200	
	Sig. (2-tailed)	.091	Cannot Reject H_0
	N	73	

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

*. Correlation is significant at the 0.05 level (2-tailed).

Table 23 shows the association between the number of years teachers had been teaching in the SIE program and their TPACK competency. The data reveals that there was no significant relationship between the tenure of teachers in the SIE program and their competency in using the TPACK framework to facilitate learning for all types of learners, including LSENs. This implies that both neophyte teachers and tenured SpEdTs and RevTs had sufficient knowledge and skills to use assistive technologies and educational technology to adapt instruction based on learners' context.The lack of a statistically significant association suggests that all teachers, regardless of experience level, should have prioritize professional development and technology application training. It implies that proficiency in using technology to teach LSENs was not assured by expertise alone. Thus, TPACK-focused targeted professional development programs might have be required to improve teachers' abilities regardless of their years of teaching experience. According to Tondeur et al. (2019), it was important to support novice teachers in developing TPACK for special education contexts. Moreover, Sonsupap et al. (2024) elaborated upon during the interviews of respondents revealing two critical professional development needs. First, teachers wanted professional development that elevated their understanding of using digital tools to teach their curricula to diverse groups of learners. Second, they wanted a professional development that focused on the technology readily available to them and often were trained in technology tools that they don't had access to or that don't seem to fit with the content they're required to teach. It would be more helpful to had training that shows them what it could have look like in their actual classrooms. Furthermore, Nuruzzakiah et al. (2022) suggested that technology should have be included in preparatory programs for teachers under SIE programs and should have cover a different range of tools such as learning management systems, academic platforms, behavior tracking apps and social assistive technology. Moreover, special education policies should have be improved to develop understanding and awareness of the importance of using technology in special education classroom practices.

Table 24: Association Between the Respondents Level of TPACK Framework Competencies and Their Types of Classrooms

	Pearson Chi-Square Coefficient	df	P-value (2-sided)	Decision on H_0
Technological Knowledge	21.425	15	.124	Cannot Reject H_0
Content Knowledge	23.132	12	.027	Reject H_0
Pedagogical Knowledge	14.398	12	.276	Cannot Reject H_0
Pedagogical Content Knowledge	5.048	12	.956	Cannot Reject H_0
Technological Pedagogical Knowledge	7.910	12	.792	Cannot Reject H_0
Technological Content Knowledge	22.953	14	.061	Cannot Reject H_0
Technological Pedagogical Content Knowledge	17.834	12	.121	Cannot Reject H_0

Table 24 presents the relationship between respondents' types of classrooms (e.g., self-contained and inclusive) and their competencies in the TPACK framework. The data reveled that there was no significant association between classroom types and the competencies, except for CK, where the P-value was 0.027, indicating a significant relationship. This suggests that the type of classroom setting might have influence respondents' CK, but not their technological, pedagogical, or integrated TPACK competencies. Jung & Ottenbreit-Leftwich (2019) emphasize the importance of CK in effectively applying technology, particularly in specialized classroom settings, aligning with the findings on CK. Bansal (2023) also support this, highlighting how cross-disciplinary approaches enhance CK and overall TPACK competencies. Similarly, Cojorn and Sonsupap (2024) found that content knowledge varies across classroom types, suggesting that the demands of different teaching environments influence CK more than other TPACK components. This emphasizes the need for professional development programs tailored to enhance CK and technology application strategies for various classroom types.

Table 25: Association Between the Respondents Level of TPACK Framework Competencies and Their Number of LSENs in the Class

		Number of LSENs in Class	Decision on H_0
Technological Knowledge	Pearson Correlation	.096	
	Sig. (2-tailed)	.421	Cannot Reject H_0
	N	73	
Content Knowledge	Pearson Correlation	.104	
	Sig. (2-tailed)	.381	Cannot Reject H_0
	N	73	
Pedagogical Knowledge	Pearson Correlation	.021	
	Sig. (2-tailed)	.860	Cannot Reject H_0
	N	73	
Pedagogical Content Knowledge	Pearson Correlation	.035	Cannot Reject H_0

	Sig. (2-tailed)	.768	
	N	73	
Technological Pedagogical Knowledge	Pearson Correlation	-.018	
	Sig. (2-tailed)	.878	Cannot Reject H_0
	N	73	
Technological Content Knowledge	Pearson Correlation	.069	
	Sig. (2-tailed)	.560	Cannot Reject H_0
	N	73	
Technological Pedagogical Content Knowledge	Pearson Correlation	.197	
	Sig. (2-tailed)	.096	Cannot Reject H_0
	N	73	

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

*. Correlation is significant at the 0.05 level (2-tailed).

Table 25 reveals no significant association between the number of LSENs in the class and any component of TPACK framework. This suggests that the presence of LSENs in the classroom did not significantly impact teachers' competencies in the TPACK framework. This aligns with recent literature, which underscores the challenges teachers face in applying TPACK effectively in diverse classrooms. Mayer and Rose (2020) highlighted that while TPACK was crucial for effective teaching, its practical application varies, particularly in inclusive settings. Similarly, Westwood (2018) found that many teachers feel inadequately prepared to adapt their TPACK skills to accommodate LSENs. Li et al. (2022) also noted that despite the theoretical importance of TPACK, its practical implementation remains challenging in classrooms with diverse learning needs. These findings suggest that improving TPACK alone might have not be sufficient for effectively supporting LSENs. Applying inclusive education principles into TPACK professional development could have enhance teachers' ability to address the needs of LSENs more effectively. Hornby and Kauffman (2024) propose that targeted professional development focused on inclusive education strategies could have bridge this gap, enabling teachers to provide equitable learning opportunities for all learners. Thus, while TPACK was essential, its development should have been complemented with training that specifically addresses inclusive education to better support diverse classroom settings.

Table 26: Association Between the Respondents Level of TPACK Framework Competencies and Their Total Hours of Trainings and Seminars Attended Related to Technology Integration

		Total Hours of Trainings and Seminars Attended Related to Technology Integration	Decision on H_0
Technological Knowledge	Pearson Correlation	.130	
	Sig. (2-tailed)	.273	Cannot Reject H_0
	N	73	
Content Knowledge	Pearson Correlation	.107	
	Sig. (2-tailed)	.369	Cannot Reject H_0
	N	73	
Pedagogical Knowledge	Pearson Correlation	-.111	
	Sig. (2-tailed)	.350	Cannot Reject H_0
	N	73	

Pedagogical Content Knowledge	Pearson Correlation	.021	Cannot Reject H_0
	Sig. (2-tailed)	.858	
	N	73	
Technological Pedagogical Knowledge	Pearson Correlation	.035	Cannot Reject H_0
	Sig. (2-tailed)	.769	
	N	73	
Technological Content Knowledge	Pearson Correlation	.135	Cannot Reject H_0
	Sig. (2-tailed)	.256	
	N	73	
Technological Pedagogical Content Knowledge	Pearson Correlation	.169	Cannot Reject H_0
	Sig. (2-tailed)	.154	
	N	73	

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

*. Correlation is significant at the 0.05 level (2-tailed).

Table 26 presents the association between various components of the TPACK framework and the total hours of training and seminars attended related to technology application. Based on the results, none of the seven components of the TPACK framework show a significant relationship with the number of hours teachers spent upskilling their ability to apply technology in managing all types of learners, including LSENs. The data implies that teachers demonstrate proficiency in applying the TPACK framework in inclusive settings even before undergoing different technological enrichment programs. The statements align with recent literature, which highlights the challenges teachers encounter in effectively integrating technology into their teaching practices. For example, Alshammari et al. (2020) discovered that while professional development could have enhanced teachers' technological knowledge, it often did not translate into improved pedagogical practices. Similarly, Aliyu (2024) indicated that many teachers attend training sessions but still struggle to apply what they had learned in real classroom settings, resulting in minimal changes to their teaching approaches. Santos and Castro (2020) reported that targeted technology application training positively impacted teachers' TPACK development, particularly in TK and TPK. Furthermore, a review by Gyasi (2020) emphasized that mere exposure to training did not guarantee effective technology application, suggesting that a more holistic approach to professional development was needed. Additionally, the stud Kopcha et al. (2021) highlighted that teachers require ongoing support and collaborative opportunities to effectively implement technology in their classrooms. Taken together, these findings suggest that while training hours might have correlate positively with certain TPACK components, significant gaps remain in translating this knowledge into practice. More comprehensive and contextually relevant professional development initiatives that not only enhance TPACK but also facilitate practical application in diverse educational settings.

IV. CONCLUSION AND RECOMMENDATIONS

This study concludes that female SpEdT and RevT were nearing retirement. These teachers were balancing career development and family life. They commonly manage learners with neurodevelopmental disorders beyond the expected teacher-to-learner ratio, under a learning environment that fosters critical pedagogy. Moreover, components of the TPACK framework show significant relations to the teachers' profiles, particularly in terms of sex and civil status. Teachers applying the TPACK framework to manage all types of learners, including LSENs, teachers need further improvement in terms of TCK, PCK, and TK. Overall, the teachers' competency in applying the TPACK framework in SIE programs was *"Competent."*. To improve technology integration among Filipino teachers in special and inclusive education, professional development programs, interagency partnerships, and regular competency monitoring were essential. These interventions would help teachers become skilled in applying the TPACK framework to support learning for all learners, including LSENs. Based on the research finding that the top three TPACK components needing improvement were Technological Knowledge, Pedagogical Knowledge, and Pedagogical Content Knowledge.

For TK, teachers need extensive training in basic and advanced technology skills to enhance the learning experience. Working with professionals from the ICT industry could have help teachers improve their ability to use high-tech educational and assistive tools effectively. In PCK, training should have focus on adapting instruction, such as modifying the curriculum, learning experiences, materials, and environment to fit each learner's needs. Teachers had to understand the process of providing appropriate accommodations, especially for learners with varying degrees of difficulty. Mentorship programs and feedback from experts in differentiated instruction, such as multisensory learning, scaffolding, and peer teaching, should have be a part of school management practices. For TCK, collaboration with ICT experts, academicians, and teachers in special and inclusive education was key to selecting the right technology and tools for effectively teaching content. This teamwork would help teachers stay current with technological advances, ensuring that learning materials remain engaging and suitable for all learners, including LSENs. Regular competency monitoring should have been conducted annually to support and evaluate teachers' ability to applytechnology and use different teaching strategies to meet individual learning needs.

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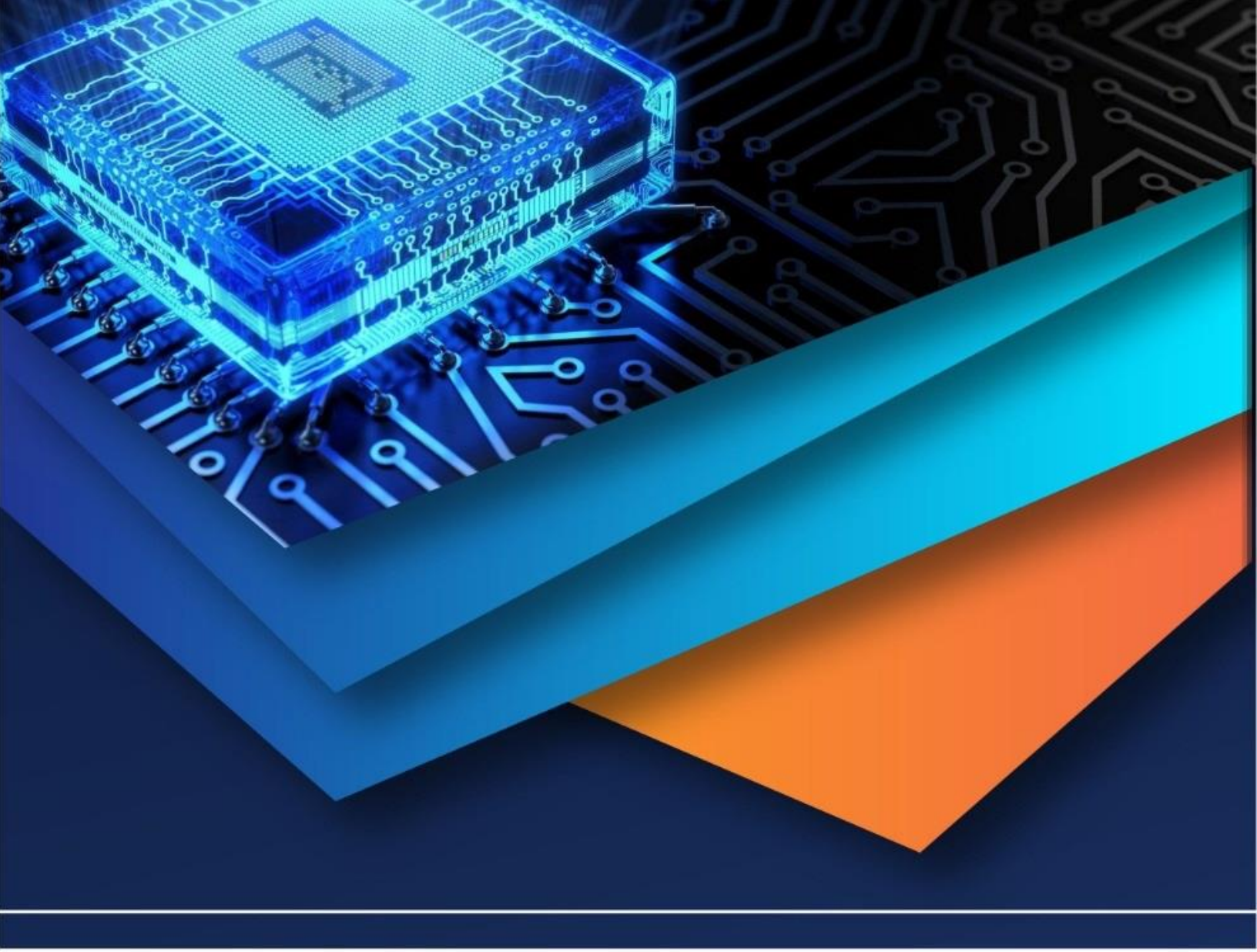

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