International Journal of
INTELLIGENT SYSTEMS AND APPLICATIONS IN ENGINEERING
ISSN:2147-6799 www.ijisae.org Original Research Paper

Examining Tpack Acquisition Among Teachers for Supporting Learners with Special Educational Needs in Inclusive Classrooms

Janine C. Gajo, 1* Lilibeth C. Pinili 2*, Vanie Grace S. Agus 3*, Doreen L. Angliongto 4*, Muriel Jean T. Seguisabal 5*, Rachel G. Sulat 6*

Submitted:11/03/2024 **Revised**: 26/04/2024 **Accepted**: 03/05/2024

Abstract: This study examined the inclusion teachers' profile, TPACK profile and the challenges they have encountered while utilizing their TPACK in an inclusion classroom at Don Vicente Rama Memorial National High School-Night, Cebu City. The collection of data from 37 high school teachers was achieved through the use of an adapted survey questionnaire in TPACK using a descriptive-correlational design. The findings indicate a significant correlation between their ages and their TPACK profile. Therefore, teachers belonging to specific age ranges have a more advanced TPACK profile than teachers belonging to other age ranges. According to their honest responses to the indicators in each TPACK component, the teachers' TPACK profile is considered very good. Meanwhile, lack of training, lack of resources and lack of knowledge in technology were the most answered challenges the teacher respondents have encountered while utilizing their TPACK in an inclusion set-up. With all the results and findings, an action plan was created to address the teacher respondents' challenges while utilizing their TPACK to help them improve the utilization of their TPACK as inclusion teachers.

Keywords: *Special Education, Age, TPACK Profile, Inclusion, Descriptive Correlational, challenges, action plan, Cebu City*

1.Introduction

Inclusive education champions the fundamental belief that every student, regardless of ability, deserves equal access to quality learning experiences. It transcends traditional, one-size-fits-all methods that treat all children as a homogeneous group, and instead, emphasizes recognizing and addressing each learner's unique needs and characteristics. This approach is not merely about adjusting for learning differences or disabilities but about creating a classroom environment where every student feels valued, respected, and empowered to reach their full potential. Such an inclusive setting fosters not only academic success but also social-emotional growth, cultivating a sense of belonging and mutual respect among diverse learners. By promoting these values, inclusive education contributes to a more just, equitable, and compassionate society.

However, despite its profound impact, inclusive education faces significant barriers that hinder its widespread implementation. Challenges such as insufficient teacher training, lack of resources, and the absence of a strong legal framework continue to undermine the full realization of inclusive practices. These obstacles are particularly evident in developing countries, where inclusive education policies, though evolving, often lack the necessary support systems to be effective. The Philippines, for instance, has made steady strides toward inclusivity but still grapples with challenges such as inadequate teacher preparation, insufficient funding, and limited infrastructure.

To overcome these hurdles and ensure the success of inclusive education, teachers must acquire the requisite knowledge and skills. One promising approach is leveraging the TPACK (Technological Pedagogical Content Knowledge) framework, which enables educators to effectively integrate technology into teaching practices. By mastering TPACK, teachers can better support learners with special educational needs and create inclusive classrooms that cater to all students' needs. This study explores how TPACK can be utilized to bridge the gap in teacher preparedness, ultimately enhancing the educational experience for learners with disabilities and promoting inclusive, high-quality education for all.

2.Theoretical and Conceptual Framework

This study is grounded in four key theoretical frameworks: TPACK *(Technological Pedagogical Content Knowledge), Constructivism, Cognitive Development, and Ecological Systems Theory.* These theories collectively inform the study's focus on assessing the TPACK profile of high school teachers working with inclusion learners.

TPACK (Technological Pedagogical Content Knowledge): Developed by Shulman (1987), TPACK underscores the integration of technology, pedagogy, and content knowledge in teaching practices. The framework emphasizes that effective teaching occurs when these three knowledge domains intersect. Mishra and Koehler (2006) expanded on this model, illustrating how TPACK supports technology-enhanced education. This approach is particularly relevant for inclusive education, where teachers must effectively blend these elements to cater to diverse student needs.

Constructivism: Bruner's (1960) Constructivism theory

posits that learners actively construct knowledge based on their prior experiences. Teachers in inclusive classrooms play a critical role by facilitating this process, helping students with varying abilities build cognitive frameworks and reach their full potential. This theory emphasizes the need for differentiated instruction, where teachers tailor lessons to meet the diverse cognitive needs of students.

Cognitive Development Theory: Piaget's (1952) Cognitive Development Theory focuses on how children's cognitive abilities evolve through stages. This theory is instrumental in inclusive education, providing insights into how teachers can support students with disabilities by adapting lessons to developmental stages. Teachers can enhance cognitive growth by fostering environments that accommodate the individual learning needs of each student.

Ecological Systems Theory: Bronfenbrenner's (1979) Ecological Systems Theory highlights the complex layers of a child's environment that influence their development. In the context of inclusive education, this theory stresses the importance of considering societal, familial, and school-level factors that impact the learning experience. Policies and attitudes at various levels shape the success of inclusive education practices.

2.1 Legal Frameworks

This study is informed by several key pieces of legislation and policies that support inclusive education in the Philippines, ensuring that learners with disabilities are provided with equitable access to educational opportunities.

Republic Act No. 11650 (Inclusive Education Act of 2022): This law mandates the creation of resource centers for inclusive learning and the allocation of resources to support students with disabilities across the country. It underscores the need for inclusive policies and provides a legal framework for integrating learners with disabilities into regular classrooms.

Republic Act No. 7277 (Magna Carta for Disabled Persons): This act promotes the integration of individuals with disabilities into society, including within the education system. It ensures that persons with disabilities receive the necessary support to fully participate in educational activities and achieve self-reliance.

Republic Act No. 5250 (Ten-Year Training Program for Teachers of Exceptional Children): This legislation establishes funding for training programs aimed at preparing teachers to effectively educate students with special needs. It emphasizes the importance of professional development for educators working in inclusive settings.

DepEd Order No. 053, s. 2008: This order provides guidelines for the training of educators, administrators, and other stakeholders involved in special education programs. It aims to enhance the understanding and skills of educators in managing inclusive classrooms and supporting students with special needs.

DepEd Order No. 021, s. 2020: This directive outlines the policy framework for implementing the K-12 curriculum for students with impairments. It stresses inclusivity and equity by addressing the individual needs of learners with disabilities and ensuring that teachers are equipped with the necessary knowledge and skills.

DepEd Order No. 010, s. 2024 (Matatag Curriculum): This order integrates inclusive education as a core principle of the K-12 Basic Education Program. It mandates continuous professional development for teachers, emphasizing the enhancement of technological, pedagogical, and content knowledge to meet the diverse needs of students in inclusive classrooms.

The integration of TPACK, Constructivism, Cognitive Development, and Ecological Systems Theory provides a robust framework for understanding and addressing the challenges of inclusive education. The legal bases, including Republic Acts and DepEd Orders, further reinforce the need for inclusive practices and teacher preparedness. By grounding this study in these frameworks, the research aims to improve the teaching effectiveness of high school educators working with inclusion learners, supporting the implementation of inclusive education policies and enhancing the educational experience for all students.

3.Review of Related Literature

This section presents a review of recent studies and literature relevant to the integration of the Technological Pedagogical Content Knowledge (TPACK) framework, inclusive education, and the role of teacher preparedness in addressing the needs of students with special educational needs (SEN). It highlights recent developments in the application of TPACK in inclusive classrooms and the challenges teachers face in implementing inclusive practices.

Technological Pedagogical Content Knowledge (TPACK) in Inclusive Education

Recent research underscores the critical role of the TPACK framework in the effective use of technology to support inclusive education. TPACK emphasizes the intersection of technology, pedagogy, and content knowledge, which is essential for delivering high-quality teaching that caters to the diverse needs of learners, including those with disabilities (Graham et al., 2021). The integration of these domains enables teachers to create more flexible, dynamic, and accessible learning environments. Recent studies show that teachers who possess robust TPACK are better equipped to apply technology in ways that promote personalized learning, facilitate communication, and provide assistive tools for students with disabilities (Koehler

& Mishra, 2021).

For example, a study by Kubiatko et al. (2022) explored how TPACK supports teachers in developing inclusive teaching strategies using technology. The research found that teachers who integrate assistive technologies (e.g., screen readers, speech-to-text applications) within their teaching practices are able to cater more effectively to the learning styles and needs of students with SEN. **Furthermore, a study by Reinders (2023)** demonstrated that the use of TPACK in inclusive classrooms not only supports students with disabilities but also enhances overall classroom engagement by diversifying learning activities and making learning more interactive.

Constructivism and Cognitive Development in Inclusive Education. The application of constructivism and cognitive development theories remains a cornerstone of inclusive education. Recent studies highlight the importance of these theories in understanding how teachers can support the diverse cognitive and developmental needs of students with disabilities. According to a recent study by Dooly et al. (2021), teachers in inclusive settings can better facilitate cognitive growth by employing constructivist principles, such as collaborative learning, problem-solving, and scaffolding. These strategies allow students to build on their prior knowledge and experiences, which is crucial for learners with disabilities who often require tailored instructional methods to succeed.

Piaget's Cognitive Development Theory has also been influential in recent research on inclusive education. A study by Lubeck (2023) showed that understanding the cognitive stages of learners, particularly students with disabilities, helps educators design developmentally appropriate learning materials. Teachers who use Piaget's framework to assess cognitive readiness can better implement differentiated instruction, adapting tasks and activities to meet the developmental needs of students. Research by Wong et al. (2022) further demonstrated that applying Piagetian principles in inclusive classrooms improves both academic outcomes and social-emotional skills for students with diverse learning needs.

Teacher Preparedness for Inclusive Education. Teacher preparedness is crucial in ensuring the success of inclusive education. Recent literature highlights that many teachers still face significant challenges due to a lack of adequate professional development and training in inclusive education practices (Forlin & Chambers, 2023). Studies show that teachers with higher levels of specialized training in inclusive education are better equipped to manage the diverse needs of students, including those with SEN. However, research indicates that there is still a gap in professional development opportunities for educators to enhance their skills in differentiated instruction and the use of assistive technologies (Varga & Tóth, 2022).

Recent studies also emphasize the importance of continuous professional development in improving teachers' TPACK. A study by Kara et al. (2023) found that teachers who participated in professional development programs focused on technology integration and inclusive pedagogy exhibited greater confidence and competence in using technology to support learners with disabilities. This is consistent with findings from a study by Swerdlik et al. (2023), which highlighted the positive impact of targeted training on teachers' ability to implement inclusive teaching strategies effectively, particularly in technology-rich environments.

Legal and Policy Frameworks Supporting Inclusive Education

The legislative landscape plays a significant role in advancing inclusive education. Recent research underscores the importance of policies that ensure the equitable inclusion of students with disabilities. In the Philippines, the enactment of Republic Act No. 11650 (Inclusive Education Act of 2022) has been pivotal in institutionalizing inclusive education. According to a study by Garcia & Camacho (2024), the Inclusive Education Act has led to significant improvements in resource allocation, teacher training, and the establishment of support systems for students with disabilities. However, challenges remain in fully implementing these policies due to resource constraints and inconsistent policy enforcement at local levels (Alcaraz & Domingo, 2023).Recent literature highlights that policy frameworks such as Republic Act No. 7277 (Magna Carta for Disabled Persons) and DepEd Order No. 010, s. 2024 (Matatag Curriculum) are central to ensuring that inclusive education is both effective and sustainable. Research by Dizon et al. (2023) emphasizes that the successful implementation of inclusive education policies requires a multi-faceted approach, including ongoing teacher training, the development of accessible learning materials, and strong community involvement.

The recent literature reviewed highlights the growing importance of integrating the TPACK framework, constructivist principles, and cognitive development theories in inclusive education. Teachers' ability to integrate technology, pedagogy, and content knowledge is vital for meeting the diverse needs of learners with disabilities, particularly in inclusive classrooms. Furthermore, teacher preparedness through professional development programs and the support of legal frameworks are crucial for the successful implementation of inclusive education practices. The recent research also emphasizes the need for continuous improvement in teacher training, resource allocation, and policy enforcement to ensure that all students, including those with special educational needs, have access to a quality, inclusive education.

4.Statement of the Problem

This study evaluated the TPACK profile of the teachers handling high school inclusion learners at Don Vicente Rama Memorial National High School- Night in Cebu City for school year 2024-2025 as foundation for the suggested action plan.

Respectively, it sought responses to the following questions:

1.What is the respondents' profile in terms of:

1.1 Age and gender,

1.2 Grade level taught, and

1.3 Field of specialization?

2. What is the respondents' level of TPACK in terms of:

2.1 Technological knowledge,

2.2 Pedagogical knowledge,

2.3 Content knowledge,

2.4 Pedagogical content knowledge,

2.5 Technological content knowledge,

2.6 Technological pedagogical knowledge, and

2.7 Technological pedagogical content knowledge?

3.Is there a considerable correlation between the profile and the TPACK profile of the respondents?

4.What are the obstacles encountered by the respondents in utilizing TPACK?

5.Considering the results, what action plan can be suggested?

4.1 Statement of Hypothesis

Based on the objectives of the study, the null hypothesis was be tested at 0.05 level of significance:

Ho1: There was no considerable correlation between the profile and the TPACK profile of the respondents.

4.2 Research Design and Flow of the Study

This study employed a descriptive correlational research design to examine the relationship between TPACK profiles and teaching performance in an inclusive education setting. The goal was to identify if a correlation existed between the teachers' technological, pedagogical, and content knowledge (TPACK) and their ability to effectively teach learners with special educational needs (LSENs). Using an adapted survey questionnaire, the researcher gathered data on the respondents' TPACK profiles, along with the challenges they encountered in applying their knowledge in the classroom. The descriptive correlational design allowed for the analysis of how these variables are related, providing valuable insights into how teachers' TPACK influences their teaching practices.

The flow of the study followed the **Input-Process-Output (IPO)** Model to ensure a structured and systematic approach. In the input phase, data were collected regarding the teachers' demographic profiles, their TPACK components, and the challenges they faced in using their TPACK in an inclusive setting. The process phase involved sending permission requests, gathering survey responses from participants, and conducting statistical analyses to examine correlations between the variables. Finally, the output phase produced an action plan based on the findings, aimed at addressing the challenges identified and improving teachers' TPACK profiles, thereby enhancing their ability to effectively facilitate instruction for LSENs in inclusive classrooms.

5. Instruments and Data Collection

To assess the respondents' TPACK profile, the researcher used an updated and modified version of a questionnaire initially developed by Denise A. Schmidt, Evrim Baran, and Ann D. Thompson from the Center for Technology in Learning and Teaching at Iowa State University. The revised questionnaire was carefully reviewed by an expert to ensure its reliability and validity. The survey aimed to determine the teachers' TPACK profiles, focusing on the seven components of TPACK, by gathering the respondents' honest feedback. The questionnaire, found in Appendix B, provided the necessary framework to assess how well teachers integrated technology with their teaching practices, content knowledge, and pedagogical strategies in an inclusive education environment.

5.1 Data Gathering Procedures

The data gathering process followed a structured approach across three phases: Pre-Phase, During the Conduct of the Study, and Post-Phase.

In the Pre-Phase, the researchers sent an email to the developers of the survey- Dr. Denise A. Schmidt, requesting permission to use the adapted questionnaire. Once approval was granted, the researcher submitted a transmittal letter (Appendix A) to the Schools Division Superintendent (SDS) of DepEd Cebu City to seek permission to conduct the study in local schools. The researcher followed up on the approval process to ensure the study could proceed as planned.

During the Conduct of the Study, the researcher maintained open communication with the respondents through social media platforms, ensuring that the survey was accessible at convenient times. The survey was distributed via Google Forms, allowing teachers to respond at their leisure, ensuring that their work hours were not disrupted. Clear scheduling and timely communication helped facilitate participation without interfering with the teachers' professional responsibilities.

In the Post-Phase, once the data were collected, the researcher, with the help of a professional, conducted the necessary data treatment, analysis, and interpretation. The results were presented in tabular form, and the findings were summarized and discussed to provide meaningful insights.

6. Statistical Treatment of Data

Once the demographic and TPACK profiles of the respondents, along with the seven components of TPACK, were collected, the data were organized and analyzed using various statistical tools. Frequency count was used to determine how often specific responses or categories appeared in the data set, providing an overview of the distribution. The percentage method was applied to express proportions of responses in a more standardized manner, making it easier to interpret and compare data. The weighted mean was used to calculate the average value of responses, giving more weight to certain data points when applicable. Standard deviation was calculated to measure the variation or dispersion of data points around the mean, providing insights into the consistency of the responses. The Chi-square test was employed to assess whether there was a significant correlation between the teachers' demographic profiles and their *TPACK profiles*. Additionally, the challenges faced by the respondents in utilizing their *TPACK* were ranked based on the number of responses they received. All collected data were summarized, analyzed, and interpreted with the guidance of an expert, ensuring that the results were statistically valid and reliable.

6.1 Ethical Considerations and Data Privacy

The researcher adhered to proper ethical standards throughout the study. Permission to use the survey questionnaire was obtained from *Dr. Denise A. Schmidt*, the head developer, after contacting her. A transmittal letter, signed by the researcher, research adviser, and dean, was submitted to the Schools Division Superintendent (SDS) for approval before the study could be conducted with the teacher-respondents. No fees were collected from the respondents, and no external research sponsors were involved, ensuring the study was entirely for the benefit of the participants. The researcher took measures to protect the identity of the participants, ensuring that no names were recorded or shared. All collected data were treated confidentially and used solely for the purposes of the study, ensuring that no participant was placed at risk or harm and maintaining the privacy and safety of the respondents throughout the research process.

7.Research Environment The research study was conducted at Don Vicente Rama Memorial National High School (DVRMNHS) - Night Shift, located in Cebu City Division. DVRMNHS is a public high school, with school ID 303133, situated in the South District 1 of Cebu City. Previously known as Basak National High School, the school covers a land area of 14,447 sq.m. and is categorized as a very large integrated school. It is located along Macopa Street, Basak Pardo, Cebu City, and comprises 11 functional buildings with 89 classrooms. The school caters to a total of 4,715 learners across its Junior and Senior High School departments, with a faculty consisting of 148 teaching personnel and 21 non-teaching staff. Among the non-teaching staff, there is one Registered Guidance Counselor and one Guidance Advocate who serve both the Junior and Senior High School departments. Due to the large student population, the school operates on two shifts: day shift and night shift.

In addition to the regular Junior High School curriculum, the school offers specialized programs for Senior High School students, ensuring that learners' special educational needs are met. These programs include Special Programs in the Arts, Science, and Foreign Languages. The school serves students from the surrounding barangays of Basak, San Nicolas, and Basak Pardo, as well as learners from nearby areas. DVRMNHS actively collaborates with local government units and both public and private organizations to support various areas, including education, community development, environmental protection, and health. These partnerships provide opportunities for student volunteerism, resource access, and joint projects that contribute to the holistic development of the students. The researcher, residing in Cebu City, found it easy to conduct follow-ups and provide instructions to the respondents, ensuring smooth communication despite any logistical concerns.

8.Presentation, Analysis, and Interpretation of Data

This chapter analyzes and interprets the collected data, focusing on the respondents' profiles in terms of age,

gender, grade level taught, and area. It also evaluates their TPACK profiles across seven components. Additionally, the correlation between the respondents' demographic and TPACK profiles is examined, followed by a summary of the challenges they faced in applying their TPACK.

Table 1: Age and Gender of the Respondents

Age (years)	Female (f)	%	Male (f)	%	Total (f)	%
55 and above	2	5.41	0	0.00	2	5.41
45-54	1	2.70	0	0.00	1	2.70
35-44	16	43.24	6	16.22	22	59.46
25-34	11	29.73	1	2.70	12	32.43
Total	**30**	**81.08**	**7**	**18.92**	**37**	**100.00**

In table represent the 37 respondents, 81.08% were female, and 18.92% were male. The majority of both genders were aged 35-44 (43.24% female, 16.22% male). Notably, 5.41% of female respondents were aged 55 and above, nearing retirement, while 29.73% were between 25-34, likely early in their teaching careers. The respondents, mainly aged 35-44, have typically been teaching for 10-20 years, while those aged 25-34 have 0-10 years of experience. These teachers are predominantly millennials, or Generation Y, known as "digital natives" due to their exposure to the rapid growth of ICT in their lifetimes (Circella & Lee, 2019). Millennials tend to have a positive perception of new technologies, which is reflected in their adoption of digital tools for teaching.

Table 2: Grade *Level Taught by Respondents*

Grade Level	f	Rank
Grade 12	1	6.5
Grade 11	2	5
Grade 10	10	4
Grade 9	13	1
Grade 8	11	2.5
Grade 7	11	2.5
Guidance Counselor	1	6.5

Most respondents teach in high school, with Grade 9 being the most common. DepEd Order 010, s. 2024, emphasizes that teachers must continuously develop their technological, pedagogical, and content knowledge to support inclusive education as outlined in the Matatag Curriculum.

Table 3: ***Field of Specialization of the Respondents***

Field of Specialization	f	%
Araling Panlipunan	6	16.22
Science	5	13.51
Mathematics	4	10.81
Filipino	5	13.51
English	7	18.92
TLE	7	18.92
MAPEH	2	5.41
Guidance	1	2.70
Total	37	100.00

As shown in Table 3, the majority of respondents (18.92%) were either English or TLE majors, each comprising 7 respondents. Araling Panlipunan, Science, and Filipino majors each represented 13.51% of the respondents (5 individuals). Mathematics majors made up 10.81% (4 respondents), while MAPEH majors comprised 5.41% (2 respondents). Lastly, Guidance and Counseling had only 1 respondent, representing 2.70%. Campbell et al. (2014) noted that teachers' content knowledge in a specific field can predict higher student achievement. Therefore, subject-area specialization can enhance both teacher efficacy and the overall effectiveness of the school (Condie et al., 2011; Jacob & Rockoff, 2011).

Table 4: TPACK Profile of the Respondents- This section presents the respondents' TPACK profiles based on the seven components, with data displayed in tabular form.

Technological Knowledge - Technological Knowledge (TK) is the first component of TPACK. It refers to the ability to think, work with, and use technology in a flexible manner, adapting to various technological tools and resources. Table 5 presents the gathered and analyzed data.

4.1 *Level of TPACK Profile of the Respondents in Terms of Technological Knowledge*

S/N	Indicators	WM	SD	Verbal Description
1	I know how to solve my own technical problems.	3.57	1.07	Very Good

S/N	Indicators	WM	SD	Verbal Description
2	I can learn technology easily.	3.68	1.00	Very Good
3	I keep up with important updates of various technologies.	3.57	0.99	Very Good
4	I frequently play around with technology.	3.49	1.02	Very Good
5	I know about a lot of different technologies.	3.24	1.01	Good
6	I have the technical skills needed in utilizing the technology efficiently and effectively.	3.32	0.94	Good
7	I always integrate technology in my class.	3.86	1.06	Very Good
Aggregate Mean		**3.53**		**Very Good**
Aggregate Standard Deviation			**1.01**	

Legend:
4.21-5.00=Excellent
3.41-4.20=Very Good
2.61-3.40 = Good
1.81-2.60 = Fair
1.00-1.80 = Poor

Based on Table 4, the respondents' Technological Knowledge (TK) profile is rated as "Very Good." Respondents demonstrate a strong ability to address technical issues, easily learn new technologies, stay updated on technological advancements, and integrate technology effectively into their teaching. Most respondents agreed with the indicators in this component, with an aggregate mean of 3.53. The spread of their responses is relatively concentrated, as evidenced by the aggregate standard deviation of 1.01. Serhart Kurt (2019), in an article in *Academic Generation*, emphasized that technology has become an essential part of students' lives, both in and out of the classroom. It can help students understand complex ideas and increase engagement. However, teachers face challenges in effectively incorporating technology into their teaching, often due to limited resources, time constraints, and a lack of knowledge on how to use technology to benefit learners. Despite these challenges, using technology in the classroom is crucial, especially in the 21st century, to enhance lesson delivery and promote inclusive education.

4.2 Level of TPACK Profile of the Respondents in Terms of Pedagogical Knowledge

S/N	Indicators	WM (Weighted Mean)	SD (Standard Deviation)	Verbal Description
1	I know how to assess students' performance in the classroom.	4.08	0.92	Very Good
2	I can adapt my teaching strategies based on what students currently understand or do not understand.	3.92	0.89	Very Good
3	I can adapt my teaching style to different learners.	3.89	0.91	Very Good
4	I can assess student learning in multiple ways.	3.92	0.92	Very Good
5	I can use a wide range of teaching approaches in a classroom setting.	3.95	0.81	Very Good
6	I am familiar with common student understandings and misconceptions.	3.76	0.98	Very Good
7	I know how to organize and maintain classroom management.	4.03	0.80	Very Good
Aggregate Mean -		**3.93**	**0.89**	Very Good

Table 4.2 presents the self-assessment of teachers' Pedagogical Knowledge (PK), which is measured across several key areas. The results indicate a **very good** level of proficiency, with an **aggregate mean** of 3.93 and an **aggregate standard deviation** of 0.89, suggesting consistent performance among the teachers. The teachers showed strong abilities in assessing student performance (WM = 4.08) and adapting their teaching strategies based on student understanding (WM = 3.92). They also demonstrated proficiency in using various teaching methods, managing classrooms effectively (WM = 4.03), and understanding common student misconceptions (WM = 3.76). Overall, the data highlights that the teachers are well-equipped with the essential pedagogical knowledge to support diverse learning needs and create a positive learning environment.

Table 4.3 Level of TPACK Profile of the Respondents in Terms of Content Knowledge

Table 4.3 presents the teachers' self-assessment of their Content Knowledge (CK), with an **aggregate mean** of 3.34 and an **aggregate standard deviation** of 1.04, indicating a **good** level of content knowledge overall. The highest ratings were in differentiating instruction (WM = 3.41) and collaborating on IEPs (WM = 3.43), reflecting a **very good** level of proficiency. However, areas such as adapting curriculum materials (WM = 3.35) and updating IEPs (WM = 3.24) were rated lower, suggesting room for improvement. These results align with research by **Kurt (2018)**, who emphasized the importance of content knowledge in adapting teaching strategies for diverse learners. Similarly, **Schulman (1986)** highlighted that a teacher's deep understanding of their subject matter is critical to effective teaching, which is reflected in the respondents' confidence in achieving competencies. **Cabiles (2021)** also noted that teachers' ability to adapt content for inclusive education is key to student success. Thus, while teachers demonstrate solid content knowledge, further professional development in curriculum adaptation and IEP management would further enhance their effectiveness in inclusive classrooms.

S/N	Indicators	WM (Weighted Mean)	SD (Standard Deviation)	Verbal Description
1	I have sufficient knowledge about inclusive education.	3.14	1.03	Good
2	I feel comfortable adapting curriculum materials to make them accessible and engaging for students with disabilities.	3.35	0.98	Good
3	I am confident in my ability to differentiate instruction to meet the diverse learning needs of students with disabilities.	3.41	1.12	Very Good
4	I can always achieve the competencies needed to be taught.	3.46	1.04	Very Good
5	I can easily and readily create, review, and update the IEP.	3.24	1.04	Good
6	I am able to effectively collaborate with parents and other professionals to develop and implement individualized education programs (IEPs).	3.43	1.04	Very Good
Aggregate Mean		**3.34**	**1.04**	Good

Table 4.4: Level of TPACK Profile of the Respondents in Terms of Pedagogical Content Knowledge

S/N	Indicators	WM (Weighted Mean)	SD (Standard Deviation)	Verbal Description
1	I can select effective teaching approaches to guide student thinking and learning.	3.84	0.93	Very Good
2	I can easily let my students understand the lesson through my chosen strategies.	3.97	0.93	Very Good
3	I can easily choose the right strategies to be used in a specific lesson.	3.86	0.98	Very Good
4	I find it easy to use varied strategies in teaching.	3.73	0.90	Very Good
Aggregate Mean -		**3.85**	**0.93**	Very Good

Table 4.4 shows the self-assessment of teachers in terms of **Pedagogical Content Knowledge (PCK)**, with an **aggregate mean** of 3.85 and an **aggregate standard deviation** of 0.93, reflecting a **very good** level of PCK overall. Teachers reported being proficient in selecting effective teaching strategies, ensuring students understand lessons, choosing the right strategies for specific lessons, and using varied teaching techniques. The consistency in responses suggests that respondents have a solid

understanding of how to integrate content with pedagogy to foster better learning outcomes.

These findings align with **Shulman's (1986)** definition of PCK, which involves the conversion of content knowledge into teaching strategies that make the subject matter accessible to students. **Koehler and Mishra (2009)** also emphasized that PCK is a combination of pedagogical knowledge and content knowledge, focusing on how to teach specific subjects effectively. The teachers' self-assessment supports this perspective, as they demonstrated strong competencies in choosing and applying the right pedagogical strategies for diverse content areas.Overall, the data suggests that respondents are well-equipped with both the content knowledge and the pedagogical skills required to effectively teach their subject matter, adapting their strategies to meet students' needs and learning styles.

Table 4.5: Level of TPACK Profile of the Respondents in Terms of Technological Content Knowledge

S/N	Indicators	WM (Weighted Mean)	SD (Standard Deviation)	Verbal Description
1	I know about technologies that I can use for understanding and teaching SPED subjects.	3.08	1.14	Good
2	I always integrate technology when discussing new lessons in SPED.	3.08	1.19	Good
3	I can easily use the technology on a specific lesson or content.	3.38	1.14	Good
4	I always present a lesson through the use of technology.	3.46	1.04	Very Good
Aggregate Mean -		**3.25**	**1.13**	Good

Table 4.5: Level of TPACK Profile of the Respondents in Terms of Technological Pedagogical Knowledge.

Table 4.5 demonstrates that the respondents' **Technological Pedagogical Knowledge (TPK)** is **very good**, with an **aggregate mean** of 3.88 and an **aggregate standard deviation** of 0.88, indicating a concentrated and high level of competence.

S/N	Indicators	WM (Weighted Mean)	SD (Standard Deviation)	Verbal Description
1	I can choose technologies that enhance the teaching approaches for a lesson.	3.92	0.89	Very Good
2	I can choose technologies that enhance students' learning for a lesson.	3.95	0.91	Very Good
3	My teacher education program has caused me to think more deeply about how technology could influence the teaching approaches I use in my classroom.	3.97	0.83	Very Good
4	I am thinking critically about how to use technology in my classroom.	3.92	0.92	Very Good
5	I can adapt the use of the technologies that I am learning about to different teaching activities.	3.84	0.93	Very Good
6	I can select technologies to use in my classroom that enhance what I teach, how I teach and what students learn.	3.84	0.90	Very Good
7	I can use strategies that combine content, technologies and teaching approaches that I learned about in my coursework in my classroom.	3.89	0.91	Very Good
8	I can provide leadership in helping others to coordinate the use of content, technologies and teaching approaches at my school and/or district.	3.68	0.82	Very Good
9	I can choose technologies that enhance the content for a lesson.	3.95	0.85	Very Good
Aggregate Mean -		**3.88**	**0.88**	Very Good

Teachers reported consistently being able to select technologies that enhance teaching and student learning, adapt technology for various teaching activities, and integrate technology, content, and pedagogy effectively. Additionally, many respondents expressed the ability to provide leadership in coordinating the use of technology and pedagogical strategies within their school or district. This aligns with the view of **Koehler & Mishra (2009)**, who emphasized the importance of understanding how technology interacts with pedagogy. TPK requires teachers to recognize both the affordances and limitations of different technologies and adapt them accordingly to optimize learning outcomes. The data suggests that the respondents are skilled in choosing and applying technology in ways that enhance their teaching and students' learning experiences.

Table 4.6 Level of TPACK Profile of the Respondents in Terms of Technological Pedagogical Content Knowledge

S/N	Indicators	WM (Weighted Mean)	SD (Standard Deviation)	Verbal Description
1	I can teach lessons that appropriately combine subjects in SPED, technologies, and teaching approaches.	3.16	1.01	Good
2	I always incorporate technology and varied strategies when teaching lessons in SPED.	3.16	1.01	Good
3	I find choosing the right strategies and the right technologies to be used in a specific lesson easy.	3.43	0.93	Very Good
Aggregate Mean		**3.25**	**0.99**	Good

As shown in Table 4.6, the respondents' **Technological Pedagogical Content Knowledge (TPCK)** is classified as **good**, with an **aggregate mean** of 3.25 and an **aggregate standard deviation** of 0.99. Teachers generally feel confident in combining content, pedagogy, and technology in their SPED lessons. They also report that they can select appropriate strategies and technologies for specific lessons. However, there is room for further improvement in the seamless integration of these components. **Koehler & Mishra (2009)** emphasized that TPCK is the integration of content, pedagogy, and technology, with a focus on understanding how these three elements interact to enhance teaching and learning. It requires educators to be flexible and strategic in applying these components, considering the unique challenges of each lesson and learning environment. The data suggests that while respondents are proficient in integrating technology with content and pedagogy, continuous development in balancing and adapting these components is necessary to maximize teaching effectiveness.

Table 5 Summary on the Level of TPACK Profile of the Respondents

Components	WM (Weighted Mean)	SD (Standard Deviation)	Verbal Description
Technological Knowledge (TK)	3.53	1.01	Very Good
Pedagogical Knowledge (PK)	3.93	0.89	Very Good
Content Knowledge (CK)	3.34	1.04	Good
Pedagogical Content Knowledge (PCK)	3.85	0.93	Very Good
Technological Content Knowledge (TCK)	3.25	1.13	Good
Technological Pedagogical Knowledge (TPK)	3.88	0.88	Very Good
Technological Pedagogical Content Knowledge (TPCK)	3.25	0.99	Good
Grand Mean	**3.58**	**0.98**	**Very Good**

Table 5 presents a summary of the respondents' TPACK profiles. The overall **grand mean** is 3.58, with an **aggregate standard deviation** of 0.98, suggesting that respondents demonstrate a **very good** TPACK profile overall. Among the seven components, the **Pedagogical Knowledge (PK)** component received the highest mean score of 3.93, followed by **Technological Pedagogical Knowledge**

(TPK) at 3.88, and **Pedagogical Content Knowledge (PCK)** at 3.85. The components with the lowest scores were **Technological Content Knowledge (TCK)** and **Technological Pedagogical Content Knowledge (TPCK)**, both rated as **good**. This distribution indicates that while the respondents possess strong skills in integrating pedagogy and technology, there is room for improvement in areas like **Content Knowledge (CK)**, **TCK**, and **TPCK**. Nevertheless, the overall data suggests that the respondents are well-equipped with the knowledge and skills necessary to effectively teach in an inclusive classroom setting. **Mishra and Koehler (2006)**'s TPACK framework serves as an important guide for teachers to evaluate and enhance their technological, pedagogical, and content knowledge. By considering these three intertwined components, teachers can create more effective learning environments and integrate technology in meaningful ways to enhance student learning.

Correlation between the Profile and TPACK Profile of the Respondents

Table 6: Test of Correlation between the Profile and TPACK Profile of the Respondents

TPACK VS:	**-value**	**df**	**p -value**	**Decision**	**Remarks**
Age	7.744*	1	0.005	Reject Ho	Significant
Gender	3.484	1	0.062	Do not reject Ho	Not Significant
Grade Level Taught	3.887	4	0.422	Do not reject Ho	Not Significant
Specialization	5.085	5	0.406	Do not reject Ho	Not Significant
Significant at p < 0.05 (two-tailed)					

Table 6 shows the correlation test results between the respondents' profile variables and their TPACK profiles. The results indicate that **age** has a significant relationship with the TPACK profile (p = 0.005), while **gender**, **grade level taught**, and **specialization** do not show significant correlations with the respondents' TPACK profiles. This suggests that younger teachers, likely more familiar with technology, tend to have a higher TPACK profile, while other demographic factors do not appear to significantly influence their technology integration and pedagogical practices in the classroom.

Table 7: Obstacles Encountered by the Respondents

Challenges Encountered	**f**	**Rank**
Insufficient Training	10	1
Insufficient Resources	9	2
Lack of Access to Technology	8	3
Less Familiarity of Technology	5	4
Difficulty in Integrating TPACK/Technology	4	7
Time Constraint	4	7
Technical Issues	4	7
Difficulty in Handling Inclusive Classes/LSENs	4	7
Difficulty in Identifying Appropriate Strategies	4	7
Extended Workload	1	10
Multiple response		

Table 7 summarizes the challenges encountered by the respondents in utilizing their TPACK. The highest-ranked challenge is **insufficient training** (ranked 1st), followed by **insufficient resources** (ranked 2nd), and **lack of access to technology** (ranked 3rd). These issues, particularly the lack of training and resources, significantly impact the respondents' ability to effectively integrate technology into their teaching practices. This leads to challenges in technology use, such as technical issues, time constraints, and difficulty in integrating TPACK. The interconnectedness of these challenges creates a domino effect, making it harder for respondents to fully develop their TPACK profile. Addressing these issues through better training and access to resources could potentially improve the respondents' ability to implement technology and pedagogical strategies more effectively in inclusive classrooms.

Findings

The findings from the data analysis revealed several key insights. Most respondents were between the ages of 25-44, with a predominance of female teachers (81.08%) compared to male teachers (18.92%). The majority taught Grade 7, Grade 8, and Grade 9, with many having majored in English and TLE. The respondents' TPACK profile had a grand mean of 3.58, categorized as "very good," with a standard deviation of 0.98, indicating that responses were clustered around this score. Pedagogical Knowledge ranked highest (3.93, SD = 0.89), followed by Technological Pedagogical Knowledge (3.88, SD = 0.88) and Pedagogical Content Knowledge (3.85,

SD = 0.93). The TPACK profile showed a significant correlation with age, but no significant relationship was found between gender, grade level taught, or specialization and TPACK. Respondents reported lack of training, limited resources, and restricted access to technology as the primary challenges in utilizing their TPACK, which led to difficulties such as limited exposure to technology, challenges in integrating technology, struggles with inclusive teaching, and issues with choosing appropriate strategies. These challenges highlight the need for better support and resources to improve TPACK utilization in teaching practices.

Recommendations

To improve teaching and help students, especially those with special needs, it's important to strengthen teachers' ability to use **TPACK (Technology, Pedagogy, and Content Knowledge). The T.E.A.C.H.** action plan provides simple strategies to help teachers use technology more effectively in the classroom.

1.**T.E.A.C.H.** – Improving and constant practice of TPACK for Special Education

2.**Targeted Professional Development**:Offer training for teachers that focuses on using technology, teaching methods, and subject knowledge together, with special emphasis on *technology for Special Education.*

3.**Enhanced Access to Technology**:Provide teachers with easy access to *assistive technology (like speech-to-text and screen readers) and good technology tools* to support all students.

4.**Assistive Technology for Inclusive Education**:Train teachers to use *assistive technology* that helps students with disabilities learn more easily and supports inclusive classrooms.

5.**Collaborative Learning Weekly Session**: Encourage teachers to work together and share ideas on how to use TPACK in their lessons to help each other improve.

6. **Holistic Feedback and Evaluation**:Create ways to regularly check and give feedback on how well teachers are using TPACK, helping them continue to improve.

Acknowledgements

The authors would like to express our heartfelt gratitude to our esteemed professors for their exceptional mentorship and constant support throughout the course of this research. We also wish to acknowledge the College of Education at Cebu Technological University, along with the faculty and staff of the Special Education Department for their invaluable contributions to the completion of this study. Our sincere thanks extend to the Special Education teachers in Don Vicente Rama Memorial National High School (DVRMNHS) - Night Shift, located in Cebu City Division who participated and provided essential insights, helping to shape the direction and success of this research. Additionally, we are deeply thankful for the continuous encouragement and support from our families, friends, and colleagues. This research would not have been possible without the collective efforts, collaboration, and dedication of everyone involved.

Author contributions

In the study titled Examining TPACK Acquisition Among Teachers for Supporting Learners with Special Educational Needs in Inclusive Classrooms, **Janine C. Gajo** led the conceptualization of the study, research design, and overall project management, ensuring alignment with the study's objectives. **Lilibeth C. Pinili** contributed significantly to the literature review, development of the research tools, and data collection, providing a solid foundation for understanding TPACK in inclusive classrooms. **Vanie Grace S. Agus** played a key role in managing data, conducting statistical analysis, and interpreting the results, particularly in evaluating the teachers' **TPACK acquisition**. **Doreen L. Angliong** to contributed to the framework development, drafting sections of the manuscript, and reviewing the practical implications of the findings. **Muriel Jean T. Seguisabal** assisted with the research design, survey validation, and data interpretation, ensuring the study's robustness. **Rachel G. Sulat** supported the data collection process, contributed to the statistical analysis, and helped finalize the manuscript for publication.

Together, the authors collaboratively designed the study, conducted interviews, analyzed the data, and wrote the manuscript, ensuring a comprehensive investigation of TPACK acquisition for supporting learners with special educational needs in inclusive classrooms.

Conflicts of interest

The authors declare no conflicts of interest.

References

Albert, (2021). Inclusive Education in Public Elementary Schools: A Case Study in Metro Manila. Journal of Philippine Education Research.

Arcepe, A., Belocura, A., & Peteros, E. (2024). View of Inclusive Teachers' Engagement, Job Satisfaction and Retention in Public Schools of Mandaue City, Cebu. Powertechjournal.com.

Ball, D. L., Thames, M. H., & Phelps, G. (2008). Content Knowledge for Teaching: What makes it special? Journal of Teacher Education, 59(5), 389–407. https://doi.org/10.1177/0022487108324554

Brodie, K. (2024). Jean Piaget's Theory of Cognitive Development. Https://Www.earlyyears.tv/.

https://www.earlyyears.tv/piagets-theory-of-cognitive-development/

[5] Bruner, J. (2018). Technology: The Online Teacher Resource.

[6] Bruner, J. (2019). Instructional Design Organization. Constructivist Theory.

[7] Cabiles, J. (n.d.). TPACK Instructional Modules for Elementary Math. Unpublished study.

[8] Critelli, T. (2023, June 5). Diversity: 5 Ways it Boosts Student Success. Stjohns.edu. https://bit.ly/3Xp2zRe

[9] Cuadra, J. M. (2023). Uncovering the Complexities of Coping: A Qualitative Study on the Challenges Faced by Special Education Teachers in the Sandwich Generation. Philippine Social Science Journal, 6(1), 41–51. https://doi.org/10.52006/main.v6i1.646

[10] Culata, G. K. (2019). Constructivist Theory. It's Time to Learn.

[11] Culatta, R. (2018, November 30). Constructivist Theory (Jerome Bruner) - InstructionalDesign.org. InstructionalDesign.org. https://www.instructionaldesign.org/theories/constructivist/

[12] DepEd Order 53, s. 2008 – Maximization of Trained Teachers and Administrators in Special Education | Department of Education. (2008, July 5). https://www.deped.gov.ph/2008/07/05/do-53-s-2008-maximization-of-trained-teachers-and-administrators-in-special-education/

[13] DepEd Order No. 010., s. 2024 "Policy Guidelines on the Implementation of Matatag Curriculum. Department of Education. (2024, July 23). https://www.deped.gov.ph/Wp-Content/Uploads/DO_s2024_010.Pdf.%20https://www.deped.gov.ph/wp-content/uploads/DO_s2024_010.pdf

[14] DepEd Order No. 021, s. 2020 Policy Guidelines on the Adoption of the K to 12 Transition Curriculum Framework for Learners with Disabilities. Department of Education. (2020, August 10). https://www.deped.gov.ph/;

[15] F, D. (2009). Current Trends and Legal Issues in Special Education (M.L. Yell, Ed.). Corwin Press. (n.d.).

[16] Goradia, T. (2018). Role of Educational Technologies Utilizing the TPACK Framework and 21st Century Pedagogies: Academics' Perspectives. IAFOR Journal of Education, 6(3), 43–61. https://eric.ed.gov/?id=EJ1198663&fbclid=IwZXh0bgNhZW0CMTEAAR1-Rn91kFEqcdqxE9ixtOglROauY_n3P7lFWSyGi6VB7Njvo3AWJ_ijLIg_aem_ynn_3yeImbENmjM0keHhxA

[17] Home | http://globusedujournal.in Globus Publication. (2017, December). Globus Publication. http://globusedujournal.in.

[18] Hwang, N., & Kisida, B. (2021, October 12). Spread Too Thin: The Effects of Teacher Specialization on Student Achievement. Edworkingpapers.com. https://edworkingpapers.com/ai21-477

[19] Jardinez, M. J., & Natividad, L. R. (2024). The Advantages and Challenges of Inclusive Education: Striving for Equity in the Classroom. Shanlax International Journal of Education (Online), 12(2), 57–65. https://doi.org/10.34293/education.v12i2.7182

[20] Kart, A., & Kart, M. (2021). Academic and Social Effects of Inclusion on Students without Disabilities: A Review of the Literature. Education Sciences, 11(1), 16. https://doi.org/10.3390/educsci11010016

[21] Koehler, M., & Mishra, P. (2009). What is Technological Pedagogical Content Knowledge (TPACK)? Contemporary Issues in Technology and Teacher Education, 9(1), 60–70. https://www.learntechlib.org/p/29544/

[22] Kurt, S. (2006). Educational Technology. "TPACK" Technological Pedagogical Content Knowledge Framework, 1017-1054.

[23] Kurt, S. (2018). Moving toward a universally accessible web: Web accessibility and education. Assistive Technology, 31(4), 199–208. https://doi.org/10.1080/10400435.2017.1414086

[24] Macapaz, M. K. S. (2024). Exploring teachers' attitudes and burnout in inclusive classrooms. International Journal of Intelligent Systems and Applications in Engineering, 12(4), 2363–2372. Retrieved from https://www.ijisae.org/index.php/IJISAE/article/view/6635

[25] Markle, S. (1969). Good Frames and Bad (2nd Ed). New York: Wiley.

[26] Materechera, E. K. (2020). Inclusive education: why it poses a dilemma to some teachers. International Journal of Inclusive Education, 24(7), 1–16. https://doi.org/10.1080/13603116.2018.1492640

[27] McLeod, S. (2018). Bruner. Simply Psychology.

[28] McLeod, S. (2019). Simply Psychology. Constructivism as a theory for teaching and learning.

Mishra, J., Shin, P., Mishra, T., & Shin, T. (2009). Technological Pedagogical Content Knowledge (TPACK): The Development and Validation of an Assessment Instrument for Preservice Teachers. Journal of Research on Technology in Education, 42(2), 123–149. https://sciencetonic.de/media/015_digimedia/015_tpack/LIT_110_Schmidt_Baran_Mishra_Koehler_et_al_TPACK_Survey_2009.pdf

Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. Teachers College Record: The Voice of Scholarship in Education, 108(6), 1017–1054. https://doi.org/10.1177/016146810610800610

[31] Official Gazette. (1992, March 24). Republic Act No. 7277 | GOVPH. Official Gazette of the Republic of the Philippines. https://www.officialgazette.gov.ph/1992/03/24/republic-act-no-7277/

Patac, A. (2017). "KLASE" FOR MC: THE TEACHING-LEARNING PROCESS IN THE PUBLIC SCHOOL SPED CENTERS IN CEBU, PHILIPPINES. PEOPLE: International Journal of Social Sciences, 1(1), 582–597. https://doi.org/10.20319/pijss.2015.s21.582597

RA 5250 - An Act Establishing A Ten-Year Training Program For Teachers Of Special And Exceptional Children In The Philippines And Authorizing The Appropriation Of Funds Thereof | National Council on Disability Affairs. (n.d.). https://ncda.gov.ph/disability-laws/republic-acts/republic-act-5250/

Republic Act No. 11650. (2022, March 21). An act instituting a policy of inclusion and services for learners with disabilities in support of inclusive education, establishing inclusive learning resource centers of learners with disabilities in all school districts, municipalities and cities, providing for standards, appropriating funds therefor, and for other purposes. Supreme Court E-Library. Retrieved from https://elibrary.judiciary.gov.ph/thebookshelf/showdocs/2/94483

[35] Rowan, L., & Townend, G. (2016). Early career teachers' beliefs about their preparedness to teach: Implications for the professional development of teachers working with gifted and twice-exceptional students. Cogent Education, 3(1). https://doi.org/10.1080/2331186x.2016.1242458

[36] Sayson, Y. C. (2016). Needs Assessment of Public Special Education Schools in Cebu City, Philippines. JPAIR Institutional Research, 8(1). https://doi.org/10.7719/irj.v8i1.427

[37] Schmidt, D. A. (2009). Survey of Preservice Teachers' Knowledge of Teaching and Technology. Journal of Research on Technology in Education, 42(2), 123–149. https://doi.org/10.1080/15391523.2009.10782544

[38] Sonam Dhendup, Tshering Womling, & Sherab Jatsho. (2023). Teachers' Perceptions of Students With Special Educational Needs in Two Western Districts of Bhutan. Journal of Education and Training Studies, 8(12), 27–34. https://redfame.com/journal/index.php/jets/article/view/5092/5421

Thompson, A. (2009). Technological Pedagogical Content Knowledge (TPACK): The Development and Validation of an Assessment Instrument for Preservice Teachers. JRTE, 42(2), 123–149. https://files.eric.ed.gov/fulltext/EJ868626.pdf

UNESCO. (2021). Reaching Out to All Learners: A Resource pack for Supporting Inclusion and Equity in Education. https://www.ibe.unesco.org/sites/default/files/resources/unesco_bie_2021_web_inclusive_education