Assessing the TPACK Skills of Child Development Center Workers

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Abstract: This study looked into the technological, pedagogical, and content knowledge (TPACK) level of the child development center (CDC) workers of the municipalities of Tayum and Lagangilang through a descriptive-correlational research design using the Research & Development (R&D) method. Initially, it determined the profile of the CDC workers, their knowledge level of TPACK, the significant relationship of the given variables, and the development of a capability-building program for the respondents. The study was conducted at Tayum and Lagangilang municipal halls, involving 27 CDC workers. Total enumeration was applied to determine the respondents' population. The primary tool used in collecting data was a questionnaire which comprised a checklist and semi-formal interview. The data were treated statistically using frequency, percentages, mean, and Pearson correlation. The results showed that most respondents were middle-aged adults, tenured in the service, all female and bachelor's degree holders, and primarily engaged in local-based training/seminars. Generally, the CDC workers were slightly knowledgeable on the three TPACK aspects – slightly knowledgeable on the pedagogical and content knowledge while not knowledgeable on the technological knowledge. There was a significant relationship between at least two profile variables and the respondents' level of knowledge of the TPACK aspects. The challenges they encountered in integrating TPACK among their classes were themed into technological, pedagogical, content-related, and systemic challenges. A capability building program was carefully designed to address the low-level knowledge of the CDC workers and to capacitate them to become more efficient early childhood educators.

Keywords: Capability Building, CDC Workers, Early Childhood, Skills, TPACK

1. Introduction

The 21st-century educational landscape increasingly integrates information and communication technology, providing innovative ways to present and process knowledge across various fields. Modern technology transforms pedagogy by enabling learners to engage actively in new ways of learning. In 2019, Agustini et al. emphasised the significance of technology integration in the teaching-learning process in today's digital era. Educators now require content and pedagogical knowledge and the ability to integrate these components effectively with technology. Technology has become an immensely significant part of learners' educational experiences, assisting them in understanding complex concepts and encouraging collaboration within the learning community.

The Technological, Pedagogical, and Content Knowledge (TPACK) framework is essential to today's education system. It addresses the growing demand for technology utilization in the classroom

while focusing on content and pedagogy (Serhat, 2018). Initiated by Punya Mishra and Matthew Koehler in 2006, the TPACK framework emphasizes integrating technological knowledge, pedagogical knowledge, and content knowledge. This framework outlines how content and pedagogy should form the foundation of effective educational technology integration in diverse learning environments. It also offers a prolific approach to addressing educators' dilemmas when implementing technology in their classrooms. For technology to be effectively implemented, it must communicate the content and support the pedagogy, providing meaningful experiences for learners. Theoretically and in classroom practice, the interaction of these knowledge domains produces the flexible knowledge necessary for successful technology integration in teaching-learning.

Child Development Center (CDC) workers are indispensable in building the foundation of learning and holistic development for young children under their care. They provide tender care and educate young learners in the most effective and engaging ways possible. CDC workers must be creative, understanding, compassionate, and patient, as educating young children as early as two years old requires play and technology integration to engage and motivate them.

CDC workers typically oversee young children, craft creative activities to sustain their attention, aid their intellectual development, and promote positive interactions among children. With the rapid development of the educational landscape, CDC workers face the challenge of integrating technology into their centers to stimulate learners' curiosity, enhance their understanding, and offer engaging learning experiences. Despite the benefits, many CDC workers experience difficulties and need help to integrate technology successfully. Barriers such as cost, accessibility, lack of equipment, and time are significant. Still, the most notable barrier is their need to know how to utilize technology appropriately to benefit learners across diverse learning areas and domains.

Given the vital role of technology integration in early childhood learning environments, the researcher aimed to determine the level of technological, pedagogical, and content knowledge (TPACK) among CDC workers in the municipalities of Tayum and Lagangilang. The relationship between their profiles and knowledge levels was also analysed. The assessment and evaluation results of their TPACK levels served as the basis for developing a capability-building program to further enhance and improve their knowledge, particularly in the utilization and integration of technology.

Noting its significance, this study addressed the critical need for technology integration in early childhood education. By assessing the TPACK levels of CDC workers, this study provided valuable insights into their current capabilities and challenges. The findings informed the development of targeted professional development programs, ultimately improving the quality of education for young children. This research contributed to the broader field of educational technology by highlighting the importance of equipping educators with the necessary skills to integrate technology effectively into their teaching practices.

2. Method

A descriptive-correlational design was utilized in the study to determine the profile of the CDC workers and their TPACK level and the significant relationship between the said variables. Indicators and descriptions include the three aspects of TPACK – technological, pedagogical, and content knowledge.

There were 27 CDC workers involved in this study from the municipalities of Tayum and Lagangilang, respectively. Initially, the researcher looked into the ethical considerations concerning this study. The researcher asked permission from the municipal mayors and municipal social welfare and development officers of Tayum and Lagangilang to conduct the study in written form. Upon their affirmation, the researcher personally handed a letter to the different barangay captains of the two municipalities informing them about the study.

A questionnaire comprising a checklist and a semi-formal interview was used as the primary data-gathering tool to answer the research problems. The research tool included the different variables of the profile of the respondents and varied indicators for each type of knowledge. Results of the semi-formal interview on the challenges/problems encountered by the respondents in integrating TPACK were tabulated and ranked according to the frequency of their answers.

The process of attaining the outcome of the study began with understanding theories and related studies on technology integration in education and the skills of early childhood educators. It determined the profile of the respondents and the level of their TPACK skills. It also analysed the relationship between profile variables and the level of their TPACK skills. The respondents' answers to the challenges/problems were categorized according to frequency.

Thus, the results were the basis of crafting a capability-building program to address the CDC workers' low-level knowledge and enable them to become more efficient and effective in educating young children in their respective child development centers.

3. Results and Discussion

This section presents, analyses, and interprets the gathered data in the study.

SoP 1: What is the profile of the CDC workers in terms of the following factors:

a. age;
b. sex;
c. highest educational attainment;
d. length of service; and
e. number of trainings/seminars attended?

Table 1

Age of the CDC Workers

Age	*f*	%
21 to 30 years old	0	0.00
31 to 40 years old	9	33.30
41 to 50 years old	15	55.60
51 to 60 years old	3	11.10
61 and above	0	0.00
Total	**27**	**100.00**

Table 1 presents the age of the child development workers involved in this study. As gleaned from the table, the majority, or 15 (55.60%) of the 27 respondents, were 41 to 50. Meanwhile, 9 (33.30%) were aged 21 to 40, and only 3 (11.10%) belonged to the age bracket between 51 to 60 years old. However, none were aged 21 to 30 and 61 and above.

This means that the CDC workers of Tayum and Lagangilang were middle-aged adults. During this development period, middle-aged adults achieve greater civic and social responsibility (Havighurst, 2018). Thus, they assist young children to become responsible and happy adults later in life. Likewise, with their experiences handling their families and rearing their children, the respondents are competent enough to handle and manage their learners (Shaukat et al., 2019).

Further, this implies that the respondents' ages fit the role of rearing young children to become productive community members. Middle-age group educators display high performance-related skills, abilities, and productivity in handling young learners (Kadtong et al., 2017).

Table 2

Sex of the CDC Workers

Sex	*f*	%
Male	0	0.00
Female	27	100.00
Total	**27**	**100.00**

On the other hand, table 2 shows the sex of the respondents involved in this study. All of the respondents were female, and none of them was male.

This result denotes that female educators achieved more significant roles in directing children toward meaningful learning. Likewise, this role is attached to the old belief that women are more nurturing than men (Al-Barakat et al., 2023).

Moreover, this implies that female educators have a higher sense of purpose in educating the children under their care and pride in their work and accomplishments. Further, females display undeniable traits and behaviours that become assets in early learning environments (Altun, 2019).

Table 3

Highest Educational Attainment of the CDC Workers

Educational Attainment	*f*	%
Bachelor's degree graduate	27	100.00
Bachelor's degree graduate with master's units	0	0.00
Master's degree graduate	0	0.00
Total	**27**	**100.00**

In terms of their educational attainment, all of the respondents were bachelor's degree graduates. This means that they should have pursued their post-graduate studies for professional development. Also, some were not graduates of education-related programs, which affected their level of knowledge in terms of pedagogy.

This further implies that CDC workers should pursue a higher level of learning to strengthen their technological competencies, pedagogical abilities, and content knowledge in managing early childhood learners. Moreover, these workers should continue looking for more opportunities for professional development and growth (Assari, 2019).

Table 4

Length of Service of the CDC Workers

Length of Service	*f*	%
1 to 5 years	1	3.70
6 to 10 years	6	22.20
11 to 15 years	7	25.90
16 to 20 years	13	48.10
21 years and above	0	0.00
Total	**27**	**100.00**

Table 4 presents the length of service of the CDC workers. As gleaned from the table, 13 (48.10%) have rendered 16 to 20 years in service. Meanwhile, 7 (25.90%) have served 11 to 15 years, and 6 (22.20%) taught for 6 to 10 years. Only 1 (3.70%) had served 1 to 5 years, while no one taught for 21 years and above.

These results coincide with the ages of the respondents, which means that the older they are, the more significant the number of years they have spent teaching in the child development centers. Since most of them were middle-aged educators, they have already rendered notable years in their careers.

Moreover, their length of service connotes their strong desire to build meaningful foundations in the lives of young children. Though they only received a small amount of monthly honoraria, they still dedicated themselves and remained faithful to the service of young learners in their respective barangays (Cortez et al., 2021).

Table 5

Number of Training/Seminars attended by the CDC Workers

Number of Trainings/Seminars Attended	Local		Regional		National	
	f	%	*f*	%	*f*	%
1 to 2	1	3.70	1	3.70	27	100.00
3 to 4	19	70.40	26	96.30	0	0.00
5 and above	7	25.90	0	0.00	0	0.00
Total	**27**	**100.00**	**27**	**100.00**	**27**	**100.00**

As shown in Table 5, the CDC workers participated in local, regional, and national training and seminars. For the locally-initiated activities, 19 (70.40%) have attended 3 to 4 training/seminars while 7 (25.90%) have five and above and only 1 (3.70%) have participated in training/seminars respectively.

Similarly, most were engaged in 3 to 4 regional training/seminars. 1 (3.70%) have participated in 1 to 2 regional training/seminars, and no one attended five or more. Further, all respondents have only participated in 1 to 2 training/seminars at the national level. This means that the respondents have maximized their engagement with local-based training/seminars as part of their professional development activities. This may be because local training/seminars are easier to access regarding venue, less expenses, and the finances and resources to be used. Likewise, the respondents emphasized that they were involved in webinars, particularly during the pandemic at the regional and national levels.

This implies that most of the training/seminars attended by the respondents are on the local level because of the limited opportunities, lack of time, and other personal matters. Also, CDC workers may become less competent and less skilled in modern instructional practices and up-to-date teaching standards if they only participate in local-initiated seminars. Participating in seminars will equip the CDC workers with skills and knowledge to improve the quality of early childhood (Espina et al., 2021). Thus, teachers achieve competence in instructional planning, delivery, knowledge of the subject matter, and classroom management when engaged in holistic training/seminars (Arevalo, 2021).

SoP 2: What is the level of knowledge of CDC workers in terms of the following:
- *a. technological knowledge;*
- *b. pedagogical knowledge; and*
- *c. content knowledge?*

Table 6

Mean Rating on the Technological Knowledge of the CDC Workers

Technological Knowledge	Mean	DR
1. I design learning activities that use available technology such as desktop computers, laptops and tablets.	1.37	NK
2. I use digital resources to differentiate and enhance my learning instruction.	1.33	NK
3. I create video presentations that help explain the content and concepts of my lesson.	1.15	NK
4. I crop, resize, and edit photos and images online.	1.19	NK
5. I use educational technology tools to assess my pupils' learning.	1.15	NK
6. I use an online grading system to keep records and information on my pupils' learning progress.	1.30	NK
7. I know how to use Microsoft Office and basic word processing.	1.37	NK
8. I search the web efficiently for additional insights for my lessons at hand.	1.19	NK

Technological Knowledge	**Mean**	**DR**
9. I expand my communication with my pupils through social media apps such as E-mails, Facebook, Instagram, and Twitter.	1.44	NK
10. I use collaborative online tools to communicate and work with my colleagues.	1.41	NK
Composite Mean	**1.29**	**NK**

Note. Range of Values and Descriptive Rating (DR) 3.26 – 4.00=Knowledgeable (K), 2.51 – 3.25=Slightly Knowledgeable (SK), 1.76 – 2.50=Needs Improvement (NI), 1.00 – 1.75=Not Knowledgeable (NK)

Table 6 presents the mean rating of CDC workers' technological knowledge level. As can be gleaned, it obtained a composite mean of 1.29, described as not knowledgeable. This signifies challenges and limitations in effectively integrating technology into their teaching and administrative tasks. Likewise, opportunities to use technology to enhance learning experiences, such as interactive simulations, educational software, and multimedia resources, may be missed. As highlighted in the study of Santos and Castro (2021), the absence of multimedia elements like videos, animations, and interactive content can make lessons less dynamic and appealing.

Though the respondents assessed themselves as not knowledgeable about all the given indicators, indicator 9, *"I expand my communication with my pupils through the different social media apps such as E-mails, Facebook, Instagram and Twitter,"* got the highest mean of 1.44. This means that the CDC workers' communication efforts successfully reached and engaged their learners effectively. This implies that since most of the respondents were middle-aged, they are considered part of Generation X, which causes them difficulties in operating and utilizing technological tools in their teaching engagements (Taimalu and Luik, 2019). These difficulties may be due to a lack of technological equipment, self-confidence, time to learn technological operations, and willingness to adapt to emerging technologies in education. Likewise, the CDC workers need more technological training, which could guide and assist them in using technology in education (Spiteri and Rundgren, 2020).

Further, indicators 3, *"I create video presentations that help explain the content and concepts of my lesson,"* and 5, *"I use educational technology tools to assess my pupils' learning."* garnered the lowest means of 1.15. This means that CDC workers need to gain knowledge in creating video presentations and using technological tools to assess pupils' learning. This further implies a reduced engagement and understanding, ineffective assessment, limited accessibility and inclusivity, and increased workload for CDC workers.

Manzano (2023) emphasized that learners may find lessons less attractive without engaging video content, leading to decreased motivation and participation. Video presentations help clarify complex concepts through visual explanation. With this tool, learners can understand the material quickly. Likewise, technological tools can provide real-time feedback to pupils. Without these tools, feedback may be delayed, slowing the learning process (Espina et al., 2021).

Consequently, according to the study of Sullera (2023), video presentations can cater to different learning styles, including visual and auditory learners. Lessons might not be as inclusive if these presentations are not integrated into the learning process. Also, learners familiar with modern technologies may expect digital tools in their learning experience, so the absence of these tools might alienate them (Taimalu and Luik, 2019). Moreover, the lack of technological tools means more manual work for CDC workers in preparing materials and assessing pupils, which can be time-consuming and prone to errors (Adipat, 2021). There would be a greater need for ongoing professional development to bring CDC workers up to speed with modern educational technology.

Table 7

Mean Rating on the Pedagogical Knowledge of the CDC Workers

Pedagogical Knowledge	Mean	DR
1. I practice differentiated instruction to engage my pupils by accommodating their unique learning preferences.	2.11	NI
2. I design learning stations to allow my pupils with diverse learning needs to learn at their own pace and readiness level.	1.93	NI
3. I implement cooperative learning, which allows my pupils to work with others and consider different points of view.	3.11	SK
4. I apply the "Jigsaw Method" in my class, wherein each pupil is responsible for another's learning.	2.07	NI
5. I prepare and present technology-rich lessons that keep my pupils motivated and engaged longer in the learning process.	2.33	NI
6. I carry out inquiry-based learning, which involves my pupils in the learning process to understand better what they are learning.	2.19	NI
7. I allow my pupils to learn by asking questions, exploring things around them, and investigating and reporting what they see.	3.81	K
8. I use graphic organizers to help my pupils brainstorm their ideas in a visual presentation.	2.67	SK
9. I use concrete and natural objects as my instructional materials.	3.30	K
10. I allow my pupils to develop communication, problem-solving, cognition, and critical thinking skills.	3.56	K
Composite Mean	**2.71**	**SK**

Note. Range of Values and Descriptive Rating (DR) 3.26 – 4.00=Knowledgeable (K), 2.51 – 3.25=Slightly Knowledgeable (SK), 1.76 – 2.50=Needs Improvement (NI), 1.00 – 1.75=Not Knowledgeable (NK)

On the other hand, Table 7 explicitly shows the mean rating of the pedagogical knowledge of CDC workers. With a composite mean of 2.71, the CDC workers assessed themselves as slightly knowledgeable along with pedagogical knowledge. This posits that they have a basic understanding of the principles and methods of teaching but need a deeper, more comprehensive grasp of effective teaching strategies and practices. Moreover, they rely on a narrow range of teaching methods and strategies, potentially missing out on more effective or innovative approaches. Based on the study of Ramos et al. (2020), educators who lack pedagogical knowledge might need help with classroom management and maintaining discipline, as advanced techniques for handling various classroom situations may be unfamiliar to them. Likewise, they may need help to tailor their teaching to meet the diverse needs of students, such as those with different learning styles, abilities, and backgrounds. Thus, keeping young learners engaged and motivated can be more challenging without a more profound knowledge of pedagogical techniques (Sierra et al., 2023).

Along with its indicators, the respondents were knowledgeable in allowing their pupils to learn by asking questions, exploring things around them, investigating, and reporting what they see, with 3.81 as the highest mean. This signifies that they are well-versed in facilitating an inquiry-based learning approach necessary for early childhood classrooms. Knowledgeable CDC workers who implement inquiry-based learning create a rich educational experience that prepares learners for future academic and real-world challenges (Sullera, 2023). Moreover, indicator 10, *"I allow my pupils to develop communication, problem-solving, cognition, and critical thinking skills,"* and 9, *"I use concrete and real objects as my instructional materials,"* obtained 3.56 and 3.30 mean ratings. Both were described as knowledgeable, respectively. This indicates that the CDC workers are adept at fostering essential skills for pupils' development and future success. Hence, these skills are beneficial in an academic

setting and crucial for everyday life, helping pupils navigate personal and professional challenges. CDC workers who prioritize developing communication, problem-solving, cognition, and critical thinking skills develop learners' mindsets of continuous improvement, which always seek to enhance their skills and knowledge (Arcueno et al., 2021).

However, indicator 2, *"I design learning stations to allow my pupils with diverse learning needs to learn at their own pace and readiness level,"* obtained the lowest mean of 1.93, described as needing improvement. This indicates that improving the design of learning stations involves understanding and addressing the diverse needs of pupils, using data and feedback to refine the approach continuously, and ensuring that all pupils have the opportunity to succeed at their own pace and readiness level. Manzano (2023) states pupils will likely feel more confident in their abilities when they receive the proper support and challenge. More so, properly designed learning stations can lead to better academic outcomes as pupils receive instruction tailored to their needs (Santos and Castro, 2021).

After analysing these results, the CDC workers are still competent in utilizing particular teaching strategies to suit the needs of the young pupils appropriately. Thus, improving their pedagogical knowledge through ongoing training, professional development, and collaboration with more experienced educators can help CDC workers become more effective and confident in their teaching roles (Gamayao and Binas, 2021).

Table 8

Mean Rating on the Content Knowledge of the CDC Workers

Content Knowledge	Mean	DR
1. I know and understand the content of the early childhood education curriculum.	2.89	SK
2. I use different curriculum themes to organize concepts for my pupils.	2.74	SK
3. I integrate health, nutrition, sanitation, environmental education, and gender fairness into the curriculum.	3.56	K
4. I am familiar with the different developmental domains and what to expect.	3.56	K
5. I provide opportunities for early literacy using the child's first language.	3.04	SK
6. I implement age and individually-appropriate and socio-culturally relevant tasks for my pupils.	2.96	SK
7. I prepare individualized development plans for each child in my class.	2.85	SK
8. I let my pupils appreciate cultural diversity among the school, community, and other people in the socio-emotional development domain.	3.26	K
9. I expect my pupils to manifest the love of God, country, and fellowmen in the values development domain.	3.37	K
10. I design different physical activities to develop my pupils' fine and gross motor skills.	3.11	SK
Composite Mean	**3.13**	**SK**

Note. Range of Values and Descriptive Rating (DR) 3.26 – 4.00=Knowledgeable (K), 2.51 – 3.25=Slightly Knowledgeable (SK), 1.76 – 2.50=Needs Improvement (NI), 1.00 – 1.75=Not Knowledgeable (NK)

As seen in Table 8, the content knowledge of the CDC workers obtained a composite mean of 3.13, which is described as slightly knowledgeable. This indicates that CDC workers have a primary and superficial understanding of the subject matter they are teaching. More so, their knowledge covers

the fundamental concepts and facts but needs a deeper understanding of more complex aspects of the content. This is similar to the study of Sierra et al. (2023), in which educators who lack deep content knowledge provide fewer relevant examples and analogies to help their pupils understand complex ideas. Further, they need help to answer learners' in-depth or higher-order questions, which hinders active learning and engagement (Mumbing et al., 2021).

With its indicators, statement 3, *"I integrate health, nutrition, sanitation, environment education, and gender fairness in the curriculum."* and statement 4, *"I am familiar with the different developmental domains and what to expect in each."* got the highest means of 3.56 which were described as knowledgeable respectively. This implies that respondents were knowledgeable in integrating health, nutrition, sanitation, environment education, and gender fairness into the curriculum. Likewise, they are familiar with the different developmental domains and what to expect in each domain. This implies that the CDC workers are informed and familiar with the curriculum content of the early childhood levels since they have been tenured in the child development centers for years (Taopan et al., 2020). In addition, their understanding of subject contents and the nature of knowledge among the various learning areas was deepened with the trainings/seminars they have participated in and their life experiences as middle-aged adults (Saravia and Acosta, 2021).

However, indicator 2, *"I use different curriculum themes to organize concepts for my pupils,"* garnered the lowest mean of 2.74, described as slightly knowledgeable. This denotes that the respondents possess a basic understanding but need more depth and proficiency in effectively integrating and applying thematic approaches to instruction. Also, their ability to utilize curricular themes is limited to simple themes, which causes missed opportunities for them to explore more complex and interdisciplinary themes. As highlighted by Espina et al., 2021, young learners can hardly determine the relevance of their learning due to the absence of solid thematic connections in their lessons. With this, learning experiences could be more cohesive, as they need more knowledge to integrate different concepts and subjects fully. Moreover, the study by Taopan et al., 2020, suggests that enhancing knowledge and skills in using different curriculum themes involves investing in professional development, exploring best practices, and collaborating with peers to share ideas and strategies. This can lead to more engaging, cohesive, and effective learning experiences for young learners.

Table 9

Overall Mean Rating on the TPACK Level of the CDC Workers

Type of Knowledge	**Mean**	**DR**
Technological Knowledge	1.29	NK
Pedagogical Knowledge	2.71	SK
Content Knowledge	3.13	SK
Overall Mean	**2.38**	**SK**

Note. Range of Values and Descriptive Rating (DR) 3.26 – 4.00=Knowledgeable (K), 2.51 – 3.25=Slightly Knowledgeable (SK), 1.76 – 2.50=Needs Improvement (NI), 1.00 – 1.75=Not Knowledgeable (NK)

Table 9 indicates the level of knowledge of the CDC workers along with technological, pedagogical, and content knowledge. Overall, the respondents perceived themselves as slightly knowledgeable along the three aspects of TPACK, with an overall mean of 2.38. Content knowledge got the highest composite mean of 3.13, followed by pedagogical knowledge with 2.71, both described as slightly knowledgeable. In contrast, technological knowledge got the lowest composite mean of 1.29, described as not knowledgeable.

This means that the CDC workers are slightly knowledgeable about the topics being taught and the processes of how to associate them with young children's understanding (Hill and Florez, 2020).

Also, they are well-informed in their pedagogy, particularly on teaching methods, strategies, and techniques that help their pupils learn. However, lessons become less interactive and engaging if they are not knowledgeable in integrating educational technology tools. Likewise, it is more challenging to cater to pupils' diverse needs and learning styles without technological tools (Adipat, 2021).

SoP 3: Is there a significant relationship between the profile of the respondents to their:

a. technological knowledge;
b. pedagogical knowledge; and
c. content knowledge?

Table 10

Significant Relationship between the Profile of the CDC Workers and their TPACK Level

Profile	Technological Knowledge	Pedagogical Knowledge	Content Knowledge
Age	.649**	-.066	.558**
Sex	Correlation cannot be computed because this variable is constant. *(All of the respondents were female.)*		
Highest Educational Attainment	Correlation cannot be computed because this variable is constant. *(All of the respondents were bachelor's degree holders.)*		
Length of Service	-.186	.879**	.441*
Number of Trainings/ Seminars Attended	.545**	.468*	.291

**Significant at 0.01 Level
*Significant at 0.05 Level

As gleaned in Table 10, this explicitly shows the correlation results on the significant relationship between the profile of the CDC workers and their current TPACK level. The respondents' sex and highest educational attainment remained constant.

Initially, there was a significant relationship between the respondents' profiles, particularly in age, number of training/seminars attended, and technological knowledge. However, there is no significant relationship between their service length and technological knowledge. Further, this implies that younger educators are more willing to integrate technology into their classes than older ones. Also, new-generation teachers are digital natives, which helps them to better understand and communicate multimodal learning tasks to their pupils (Santos and Miguel, 2019). More so, if the CDC workers are engaged in more regional and national training/seminars on technology integration, they will become more competent and skilled in applying these ideas to their respective learning environments (Kundi et al., 2021).

On the other hand, there is a significant relationship between the length of service and the number of training/seminars attended to their pedagogical knowledge. There is no significant relationship between the CDC workers' age and their pedagogical knowledge. This means that the longer the years of service, the higher the level of knowledge in applying suitable teaching strategies and techniques in the learning processes. Likewise, suppose the respondents are given more opportunities to participate in regional and national training/seminars on pedagogy. In that case, they will become more equipped to manage blocks of time in early childhood classes (Mailizar et al., 2021).

Lastly, there is a significant relationship between the age and length of service and the respondents' level of content knowledge. However, no significant relationship exists between the number of training/seminars attended and their content knowledge. This denotes that as CDC workers age in service, they can achieve mastery of the daily lessons they deliver to their learners (Chaipidech et al., 2022). Moreover, they can also update their lesson contents to meet the current demands of the early childhood education curriculum.

SoP 4: What are the challenges/problems the CDC workers encounter in integrating TPACK among their classes?

As to their responses, the Child Development Center (CDC) workers faced several challenges/problems in integrating the Technological, Pedagogical, and Content Knowledge (TPACK) framework into their classrooms. These challenges were themed into technological, pedagogical, content-related, and systemic issues.

Technological Challenges

The CDC workers highlighted the limited availability of technological tools and resources such as computers, tablets, and internet connectivity in their classrooms. This hinders their ability to incorporate technology into their teaching practices. Likewise, technical assistance and support are insufficient for maintaining and troubleshooting technical tools. CDC workers may need help to use technology effectively, leading to frustration and reduced usage. More so, the rapid technological changes result in outdated practices and missed opportunities for enhancing learning experiences. The fast pace of technological advancements makes it difficult for CDC workers to stay updated with the latest tools and applications.

Pedagogical Challenges

Along with the pedagogical challenges, inadequate training on integrating technology with pedagogy and content knowledge ranked the highest. CDC workers may need more confidence and skills in using technology effectively in their teaching. Also, they needed help finding appropriate technological tools that align with pedagogical strategies and content areas, which led to ineffective or superficial use of technology that does not enhance learning. Further, some CDC workers resisted adopting new technologies due to comfort with traditional methods or fear of change. Their resistance slows down the integration process and limits the potential benefits of technology-enhanced learning.

Content-Related Challenges

The CDC workers needed help in modifying existing content to be suitable for digital formats and interactive platforms. This can result in a mismatch between the content and the technological tools used, reducing teaching effectiveness. In addition, the respondents also considered balancing screen time and developmentally appropriate practices as one of the content-related challenges. CDC workers need help balancing using technology and adhering to best practices for early childhood education.

Systemic Challenges

The CDC workers noted funding constraints, policy and administrative support, and time constraints as systemic challenges in integrating TPACK. Financial constraints prevent CDC workers from acquiring the necessary resources, such as technological tools, training programs, and infrastructure for effective TPACK integration. Likewise, without administrative and institutional support, CDC workers' efforts to integrate TPACK lack coherence and sustainability. Moreover, time constraints affect the CDC workers' abilities to plan, implement, and reflect on technology-integrated lessons.

Integrating the TPACK framework in early childhood education settings presents numerous challenges for CDC workers. Addressing these challenges requires a multifaceted approach, including increased access to technology, ongoing professional development, supportive policies, and adequate funding. By overcoming these obstacles, CDC workers can effectively harness the potential of technology to enhance their pedagogical practices and improve learning outcomes for young children.

SoP 5: What capability building program could be designed to enhance the technological, pedagogical, and content knowledge of CDC workers?

The developed capability building program is LEARN ECE, which stands for **L**evelling up **E**ducators with **A**dvanced and **R**elevant k**N**owledge in **E**arly **C**hildhood **E**ducation. The developed

capability building program will capacitate the child development workers to become more knowledgeable on technology, pedagogy, and content of the early childhood curriculum. Likewise, it will address the not knowledgeable, needs improvement, and slightly knowledgeable indicators in the three aspects of TPACK. Moreover, the program will be three days long, with at least three sessions each day, including sessions, workshops, and an assessment of outputs. Notable resource persons in the educational field will be requested to discuss the different topics purposely designed for the program. After the workshop for each part of the program, the participants are encouraged to present their outputs for critiquing and evaluation. Appropriate evaluative techniques will be utilized to assess the participants' outputs and give laudable feedback for improving their learning products.

4. Conclusion

Based on the findings of this study, the following conclusions are made:

The CDC workers were middle-aged adults, female, bachelor's degree holders, tenured in the service, and participated in local-initiated training/seminars. Some CDC workers were not Teacher Education degree program graduates, so they needed to gain knowledge of the pedagogy to be implemented and the content to be taught. They need more technological tools to hone their skills in integrating technology into their classes.

The profile of the CDC workers significantly affects and impacts their technological, pedagogical, and content knowledge levels. The CDC workers experienced varied challenges and problems that affected the successful and effective integration of TPACK among their classes. Lastly, the developed capability building program will capacitate the CDC workers to become knowledgeable on the three aspects of TPACK.

5. Suggestions

In the light of the conclusions of the study, the following recommendations are forwarded:

The developed capability building program may be presented to the early childhood education experts, local government unit officials, and DSWD authorities for its validation and immediate implementation to test its effectiveness in capacitating the CDC workers.

The CDC workers may be given other training and seminar workshops on utilizing and integrating emerging technological tools that cater to the digital contexts and interests of the learners.

The LGU officials, DSWD authorities, ECCD council members, and other agencies related to early childhood care and development may strengthen their collaboration to develop more relevant policies for delivering quality education for young learners.

Further relevant studies may be conducted by other researchers to determine the effectiveness of the developed capability building program for CDC workers.

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