Sociology & Cultural Research Review (SCRR)
Available Online: https://scrrjournal.com
Print ISSN: 3007-3103 Online ISSN: 3007-3111
Platform & Workflow by: Open Journal Systems
https://doi.org/10.5281/zenodo.18428427

Study to Diagnose the Teachers' Technological Pedagogical Content Knowledge (TPACK) in Contemporary Teaching Practices at Early Child Hood Education Level

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ABSTRACT
This study looked at overall levels, gender differences, and variations across teaching experiences in order to diagnose early childhood teachers' Technological Pedagogical Content Knowledge (TPACK) in modern teaching practices. A validated TPACK-based questionnaire measuring Technological Knowledge (TK), Pedagogical Knowledge (PK), Content Knowledge (CK), and their integration was used in a quantitative, descriptive survey with 517 early childhood educators from public and private institutions. The findings showed that teachers were highly competent in every TPACK domain, with TK scoring highest and integration of TK, PK, and CK slightly lower, indicating difficulties with cohesive application. While mid-career teachers (6–10 years) demonstrated balanced TPACK and highly experienced teachers excelled in pedagogy but lagged in technological integration, female teachers showed slightly higher integration scores than male teachers. The results emphasize the necessity of focused professional development with an emphasis on experience-sensitive training, gender-equitable support, and integrated TPACK. To improve technology-mediated learning in early childhood education, these insights guide policy initiatives, instructional design, and teacher preparation.

Keywords: *Teachers, Technological Pedagogical Content Knowledge (TPACK), Contemporary Teaching Practices, Early Child Hood Education Level.*

Introduction

The swift growth of digital technologies has significantly changed the world educational practices, not only in terms of access of information but also in terms of how teachers approach the learners in terms of digitally mediated practice. With the changing nature of education towards the demands of a globalized society being knowledge based, the old teacher competencies, where pedagogical technique and content of the subject could be considered the dominant features, are no longer enough to guarantee meaningful outcomes of learning. This change is especially imperative in early childhood education (ECE), which is a formative phase in the academic and socio-emotional development of learners and involves the role of teachers to incorporate technology so as to add value rather than interrupt developmental appropriate practices. Technological Pedagogical Content Knowledge (TPACK) model has been discussed as a model that practitioners can use as a conceptual model in diagnosing the knowledge and skills teachers need in an integrated method in using technology to incorporate into instructional practices, a combination of technological

knowledge (TK), pedagogical knowledge (PK) and content knowledge (CK) (Mishra and Koehler, 2006).

TPACK is a dynamic nexus of technology, pedagogy, and content conceptualized originally as a continuation of Pedagogical Content Knowledge (PCK) by Shulman (1986) which proposed that teachers use technology, pedagogy, and content in context-dependent instructional choices. The model assumes that successful technology integration is not merely the presence of technological skills or proficiency, but the perception of how technology can mediate pedagogical means and rich disciplinary material to increase cognitive involvement by the learners (Koehler and Mishra, 2009). When it comes to ECE, where the central learning activities are play-based, exploratory, and socially interactive, the role of technology has to be redefined in prismatic perspectives of the developmental needs of young children. This entails the implementation of digital tools in addition to reconsidering how the digital tools are related to pedagogically sound practices that can contribute to early literacy, numeracy, social-emotional growth and creative expression. Consequently, it is timely and important to diagnose TPACK of the teachers at the early childhood level.

The modern educational environment, speeded up by world-changing things like the COVID-19 pandemic, has put extra pressure on the teachers to quickly learn and implement digital technologies, without proper preparation and training. Even though the education system in the world has adopted the online and blended learning model, it has been indicated that the skill levels of teachers to use technology in an age-based pedagogical system are uneven. The studies of teacher education and professional learning mention the still existing gaps in TPACK specifically in terms of the capability to integrate technology with pedagogy and content in a meaningful and developmentally appropriate manner (Zeng et al., 2022; Fabian et al., 2024). Such discontinuities are particularly acute with regard to early childhood context in which the developmental demands, digital literacy, and teaching strategies vary significantly with those of subsequent education.

Early childhood and preschool teachers often show strong CK and PK and poor TK and integrated TPACK, which points to the necessity of facing more targeted professional development in survey and profile studies (Yang, Wu, Liao, Wu & Li, 2023; Luo, Berson, Berson and Park, 2022). Besides, the preservice teacher preparation programs are not similar in the focus on the integration of technology and do not always give the preservice teachers an opportunity to build a solid TPACK prior to joining the classroom (Lim, Lake, Beisly & Ross-Lightfoot, 2023). These issues highlight the importance of systematic diagnostic research that would determine the current position of teachers in each of TPACK domains- and what situational variables (e.g. attitude towards technology, digital literacy skills, access to resources) predict or inhibit successful integration.

There are contextual constraints that are peculiar to teachers in ECE especially. The early childhood context generally values the hands-on, play-based learning experiences that do not necessarily always fit well with traditional applications of educational technology. Moreover, the availability of professional development aligned with the area of technological integration of early childhood teachers is lower in comparison with the primary and secondary school teachers, and many early years professionals lack a clear outlook on the way of how technology could be used to advance the learning outcomes (Novianti, Noviana, Wilson and

Garzia, 2025). These circumstances lead to a diagnostic study of TPACK not only to measure competence but also to investigate the ecological and professional contexts in which the practices of teachers in the modern early childhood classrooms are shaped.

Although there is an increasing amount of international research on TPACK in general teacher education, and some of the emerging research pays attention to early childhood, few studies have been conducted on the intersection of TPACK and ECE. Specifically, there is the necessity of research that outlines the ways early childhood teachers can combine content, pedagogy and technology to facilitate developmental objectives in practical learning environments. This research tries to fill that gap by diagnosing TPACK of early childhood teachers in modern teaching practices with a view of establishing strengths, weaknesses, and contextual predictors of technologically mediated instruction. This kind of diagnostic awareness is necessary to design the professional learning, teacher education curriculum, and even policy interventions that can promote the high-quality use of technology during the early years.

Overall, TPACK framework offers a conceptually sound foundation to the knowledge systems of teachers in terms of integrating technology. Since the use of digital tools in education is rising in prominence and teachers working with early childhood learners have distinct developmental needs, the diagnosis of teacher TPACK is an academic concern and an empirical requirement. The results of this research will be used to shape teacher preparation, ongoing professional development, and instruction design specifics that will be relevant to the earliest phases of formal education and eventually make a difference in terms of the quality of provided pedagogical services and increased learning opportunities among young children.

Literature Review

TPACK framework has brought together three fundamental areas of teacher knowledge, namely, technology, pedagogy, and content, and integrated them into a unified framework that emphasizes the interactive and complex nature of sound instruction in technologically-rich classrooms. The original assumptions put forward by Mishra and Koehler (2006) asserts that it takes more than merely separate knowledge of technology or pedagogy to play an effective role in the integration of technology within instructional practices and conversely, an integrated and context sensitive understanding is necessary to work with these two areas of knowledge. TPACK broadens the content knowledge (PCK) concept proposed by Shulman (1986) to include technological knowledge (TK) and the intersections of the three to form a hybrid space (or domain), Technological Pedagogical Knowledge (TPK) and Technological Content Knowledge (TCK). It is an extension of the fact that technology can change pedagogical strategies and content presentation in parallel, which opens up possibilities of learning design.

The theoretical usefulness of TPACK is its ability to inform teacher education, curriculum development, and teacher development. It states that it is imperative that teachers do not just know technology, but also know how to use it pedagogically and how to match with certain content objectives. The influence of contextual factors on this alignment poses immense implications on classroom culture, the nature of learners and the support systems of institutions. These contextual factors may apply to early childhood teachers as children

may be developmentally ready, a priority of learning through play, and the affordance of technology to support exploration and inquiry instead of rote learning.

Empirical research on TPACK in ECE context has continued to increase in recent years, although the research field is relatively smaller than in primary and secondary education. There are an increasing amount of studies which focus on the specific intersections of technological integration and pedagogical practice of early childhood.

Luo, Berson, Berson, and Park (2022) investigated whether the TPACK framework was relevant to preschool settings in a large-scale quantitative study where they examined 1,192 in-service early childhood teachers in China. Their results indicated that there were a lot of correlations between TK, TPK, and PK, and all of them had positive impacts on the overall TPACK of teachers. Nonetheless, the role of PK was less significant, indicating that technology and pedagogical technology integration can have more significant salient roles in defining TPACK in early childhood classrooms where the content is not as well structured (Luo et al., 2022).

In the same way, Yang, Wu, Liao, Wu, and Li (2023) performed a latent profile of almost 1,000 preservice preschool teachers, which revealed specific TPACK profiles and demonstrated that most of the research participants displayed low to medium TPACK. In their work, much attention was given to the fact that teacher preparation plans have been a key factor in shaping strong TPACK skills prior to entering the classroom, especially among preservice teachers, since in most cases they lack practical examples on how to integrate technology in the classroom (Yang et al., 2023).

Lim, Lake, Beisly, and Ross-Lightfoot (2023) examined the development of TPACK in pre-service educators after taking technology-intensive courses. In this mixed-methods research, the technological pedagogy, technological content knowledge, and general TPACK improved significantly, which implies that the desired instructional experiences can help to make significant contributions to the integration competencies of teachers. Nevertheless, their study also revealed a systematic attitude-related obstacles to the usage of technologies in early education, which suggests that the attitudinal change is as significant as skills training in developing TPACK.

Novianti, Noviana, Wilson, and Garzia (2025) analyzed TPACK competencies of teachers in the early childhood in Indonesia during and after the COVID-19 pandemic. They found that teachers acknowledged the necessity of TPACK competencies but most of them had difficulties with the lack of technological resources and professional development which prevented successful implementation in their teaching practice. This highlights one of the resource-related aspects of the development of TPACK that extends past the knowledge of individual teachers.

The other current research by Sofwatul Mala, Hibana, and Divanti (2025) was on TPACK of early childhood educators in online learning settings that use digital tools. Quantitative study results indicated that the overall good TPACK levels were achieved by the teachers but Pedagogical Content Knowledge (PCK) was weak. This implies that teachers can be quite adept at integrating simple technology with pedagogical content yet they are still shallow when it comes to the implementation of pedagogical strategies that offer support to content learning using technology.

TPACK Applicability in Early Childhood

Studies in contexts show that although teachers can be very strong in CK and PK, their TK and integrated features of TPACK (i.e. blended domains such as TPK and TCK, in particular) are not always so well-developed, particularly when working in early childhood. This trend is observed in the studies that reveal that early childhood teachers independently report their confidence in the use of basic technologies but have difficulty in applying technology to pedagogically significant practice directions (Tufekci and Candan, 2023).

TPACK hybrid domains, particularly TPK and TCK are essential towards ensuring the use of technology in developmentally appropriate manners. e.g. TPK deals with the realization of the ways technology can assist in pedagogical tactics such as guided discovery or interactive storytelling, which are fundamental in ECE learning settings. The more TPK the teachers are, the more effective they can use technology to scaffold the emergent literacy or numeracy skills, instead of utilizing digital tools in a superficial or distracter oriented manner.

In addition to this, TCK allows teachers to depict and deliver content knowledge using technology. This could be through the application of digital media to explain simple scientific notions in ECE or language games in interactive applications. Nevertheless, research has revealed that pre-service and in-service teachers tend to revert to simple technologies like PowerPoint or videos without adequately matching such technologies to pedagogical goals or content aims. This gap portrays a significant gap to be filled in TPACK diagnostics and professional development.

Factors of TPACK Development

Various works stress that the development of TPACK is a complex process, which is affected by cognitive, affective, institutional, and resource-related issues. Teacher attitudes to technology and digital literacy skills, such as, are always linked with the differences in self-reported TPACK competence. In a study by Altun (2019), digital literacy and technology attitude proved to be a significant contributor to the TPACK competencies of early childhood preservice teachers, which answers the question that individual dispositions and competencies have to be developed alongside knowledge of pedagogical practices.

There is also a decisive contribution of institutional support and availability of technological resources. A study conducted by Novianti et al. (2025) and Sofwatul Mala et al. (2025) shows that the possible application of technology is limited by the contextual constraint of limited hardware, connectivity, and professional learning opportunities. These results imply that the TPACK diagnostics must go beyond the assessment of the individual knowledge to include the systemic enablers and barriers in educational settings.

The literature has consistently emphasised on the significance of long-term context-specific professional development in improving the TPACK of teachers. TPACK can be improved through preservice course work that combines technology with pedagogical strategy and content application with the support of real classroom practice (Lim et al., 2023). However, the most in-service ECE teachers, in relation to professional development, still tends to be quite fragmented or somewhat focused on specific tools of technology instead of being based on overall pedagogical design.

Reflective practice based, collaborative, and iterative design of technology-enhanced lesson professional learning has demonstrated potential in developing more profound TPACK.

Although studies that directly target the early childhood area are also a developing trend, results on similar settings indicate that teacher communities of practice, mentoring, and job-based learning experience have the potential of promoting TPACK development by empowering instructors to experiment, reflect, and refine their instruction with peers.

Objectives of the Study

1. To assess the general level of teachers' Technological Pedagogical Content Knowledge (TPACK) in relation to modern early childhood education teaching methods.
2. To Know teachers' proficiency in the three main TPACK domains: content knowledge (CK), pedagogical knowledge (PK), technological knowledge (TK), and their integration in instruction.
3. To examine the TPACK of male and female early childhood educators using modern teaching methods.
4. To examine variations in teachers' TPACK according to their early childhood education teaching experience.

Research Questions

1. How well-versed in modern early childhood education teaching methods are teachers in Technological Pedagogical Content Knowledge (TPACK)?
2. How do early childhood education teachers differ on average in terms of Technological Knowledge (TK), Pedagogical Knowledge (PK), Content Knowledge (CK), and their integration?
3. Does the TPACK of male and female teachers differ significantly in modern early childhood education practices?
4. Does teaching experience at the early childhood education level significantly affect teachers' TPACK?

Methodology

In order to assess teachers' Technological Pedagogical Content Knowledge (TPACK) in modern early childhood education practices, this study used a quantitative, descriptive survey research design. Early childhood educators employed by both public and private organizations made up the population. Data were gathered from 517 teachers, including both male and female participants with different levels of teaching experience, using a stratified random sampling technique. Technological Knowledge (TK), Pedagogical Knowledge (PK), Content Knowledge (CK), and their integration in teaching were measured using a structured questionnaire based on the TPACK framework. The validity and reliability of the instrument were satisfactory. Gender and experience-based variations in teachers' TPACK were examined using descriptive statistics (mean and standard deviation) and inferential statistics (independent sample t-test and one-way ANOVA).

Table 1

Teachers' Technological Pedagogical Content Knowledge (TPACK) in Contemporary Teaching Practices at Early Child Hood Education Level

Aspects of TPACK	N	Mean	Std. Dev.
Technological Knowledge (TK)	517	4.14	.589
Pedagogical Knowledge (PK)	517	4.11	.623
Content Knowledge (CK)	517	4.03	.631
Integration of TK, PK and CK in Teaching	517	3.93	.648

Table 1 shows the general amount of Technological Pedagogical Content Knowledge (TPACK) of teachers in the modern teaching practice on the level of early childhood education. The scores reveal that the teacher showed a very good command of TPACK in all areas where the teacher scores were above the middle of the scale. The TPACK components that had the highest mean score (M = 4.14, SD = .589) was Technological Knowledge (TK), which indicates that teachers were quite competent in applying digital tools and technologies that are applicable in an early childhood classroom. This was then trailed closely by Pedagogical Knowledge (PK) (M = 4.11, SD = .623) and Content Knowledge (CK) (M = 4.03, SD = .631) that indicated the good knowledge of the teachers about the instructions and the knowledge of the subject matter. Nevertheless, the combination of TK, PK, and CK in the instruction received the relatively lowest average mark (M = 3.93, SD =.648), implying that the teachers possess enough knowledge areas separately, but it is still difficult to implement technology in teaching and learning. In general, the results indicate an average though better level of TPACK in early childhood teachers.

Table 2

Male Teachers' Technological Pedagogical Content Knowledge (TPACK) in Contemporary Teaching Practices at Early Child Hood Education Level

Aspects of TPACK	N	Mean	Std. Dev.
Technological Knowledge (TK)	265	4.08	.591
Pedagogical Knowledge (PK)	265	4.08	.643
Content Knowledge (CK)	265	3.94	.683
Integration of TK, PK and CK in Teaching	265	3.83	.655

Table 2 will show how the Technological Pedagogical Content Knowledge (TPACK) of male teachers is embedded in modern teaching practices of early childhood education stage. The results indicate that male teachers indicated a high degree of competence in individual TPACK domains with a mean score above the midpoint of the scale. Technological Knowledge (TK) and Pedagogical Knowledge (PK) had the highest means (M = 4.08, SD =.591; M = 4.08, SD =.643) which means that male teachers were very proficient in their technologies, and they had a good command of pedagogical knowledge. The mean score (M = 3.94, SD =.683) of Content Knowledge (CK) was slightly lower but satisfactory. The least mean score was

however the integration of TK, PK, and CK in teaching (M = 3.83, SD =.655) indicating that it is not easy to integrate technology with pedagogy and content in classroom activity. In general, the findings show that male early childhood educators have a positive grade of TPACK, and integration scores are relative, which implies the necessity of specific professional growth. The results can be used to make later gender- and experience-related comparisons.

Table 3

Female Teachers' Technological Pedagogical Content Knowledge (TPACK) in Contemporary Teaching Practices at Early Child Hood Education Level

Aspects of TPACK	N	Mean	Std. Dev.
Technological Knowledge (TK)	252	4.20	.582
Pedagogical Knowledge (PK)	252	4.14	.602
Content Knowledge (CK)	252	4.13	.556
Integration of TK, PK and CK in Teaching	252	4.03	.625

Table 3 shows the degree of Technological Pedagogical Content Knowledge (TPACK) of female teachers in the modern teaching practices at the early childhood education level. The findings show that TPACK level of female teachers was high in all areas, and the means scores were above the midpoint of the scale. The greatest mean score (M = 4. 20, SD =. 582) was observed in the area of Technological Knowledge (TK), which indicates that female teachers are highly technologically competent. This was preceded by Pedagogical Knowledge (PK) (M = 4.14, SD =.602) and Content Knowledge (CK) (M = 4.13, SD =.556), implying good pedagogical methodology and conceptualization of the subject matter. Interestingly, the combination of TK, PK, and CK in instruction also got a relatively high mean score (M = 4.03, SD =.625) which means that instructional integration was accomplished better by female teachers than by male teachers. In general, the results indicate that female early childhood educators have a high and well-balanced TPACK profile. These findings will help to overcome the problem of gender-based differences and form a background on which an inferential analysis can be made as to the importance of observed variations.

Table 4

Perception of Teachers' having Experience 1-5 years Regarding Teachers' Technological Pedagogical Content Knowledge (TPACK) in Contemporary Teaching Practices at Early Child Hood Education Level

Aspects of TPACK	N	Mean	Std. Dev.
Technological Knowledge (TK)	259	4.13	.557
Pedagogical Knowledge (PK)	259	4.08	.631
Content Knowledge (CK)	259	3.98	.6450
Integration of TK, PK and CK in Teaching	259	3.91	.622

Table 4 shows the attitudes of early childhood educators who have 1-5 years of teaching experience towards their Technological Pedagogical Content Knowledge (TPACK) in the

modern teaching practises. The results indicate that educators in the initial phase of their practice manifested a high general degree of TPACK, and the average scores in all domains exceed the middle point. The Technological Knowledge (TK) showed the greatest mean (M = 4.13, SD =.557), which means that relatively inexperienced teachers are sufficiently familiar with the usage of digital tools in a classroom. The next one was Pedagogical Knowledge (PK) (M = 4.08, SD =.631) and Content Knowledge (CK) (M = 3.98, SD =.645), which indicate a sufficient level of pedagogical competency and the level of knowledge of the subject matter. The combination of TK, PK, and CK in teaching demonstrated the least mean score (M = 3.91, SD =.622), which indicates that new teachers have a difficulty in integrating technology with pedagogy and content effectively. On the whole, the findings reveal a good level of TPACK in teachers who have an experience of 1-5 years and also a need to undergo specialized professional development to improve integrative teaching skills.

Table 5

Perception of Teachers' having Experience 6-10 years Regarding Teachers' Technological Pedagogical Content Knowledge (TPACK) in Contemporary Teaching Practices at Early Child Hood Education Level

Aspects of TPACK	N	Mean	Std. Dev.
Technological Knowledge (TK)	216	4.18	.631
Pedagogical Knowledge (PK)	216	4.13	.639
Content Knowledge (CK)	216	4.10	.606
Integration of TK, PK and CK in Teaching	216	3.97	.681

Table 5 shows how the early childhood teachers with 6-10 years of teaching experience perceived Technological Pedagogical Content Knowledge (TPACK) in the modern teaching practices. The data used show that there is a high general level of TPACK because all the mean scores are significantly higher than the average level. The Technological Knowledge component (TK) demonstrated the best average (M = 4.18, SD =.631) indicating that teachers of the mid-career level are highly confident in their ability to use educational technologies. This is preceded by Pedagogical Knowledge (PK) (M = 4.13, SD = .639) and Content Knowledge (CK) (M = 4.10, SD =.606) which demonstrates good pedagogical ability and mastery of the subject. The combination of TK, PK, and CK in teaching showed a relatively lower mean (M = 3.97, SD =.681), which means that, even though the teachers have high individual competencies, integrating the domains at a unified level is still rather difficult. In comparison with the other groups of experience, teachers who have 610 years of experience demonstrate slightly greater mean scores in most of the domains, which indicates that professional experience positively affects the realization of TPACK in the area of early childhood education.

Table 6

Perception of Teachers' having Experience more than 10 years Regarding Teachers' Technological Pedagogical Content Knowledge (TPACK) in Contemporary Teaching Practices at Early Child Hood Education Level

Aspects of TPACK	N	Mean	Std. Dev.
Technological Knowledge (TK)	42	4.01	.593
Pedagogical Knowledge (PK)	42	4.22	.490
Content Knowledge (CK)	42	4.05	.699
Integration of TK, PK and CK in Teaching	42	3.75	.676

Table 6 displays the perceptions of early childhood teachers who have over 10 years of teaching experience concerning the Technological Pedagogical Content Knowledge (TPACK) in the modern-day teaching practices. These highly experienced teachers show high Pedagogical Knowledge (PK) (M means 4.22, SD =.490) because they have much knowledge of teaching strategies and classroom management. Content Knowledge (CK) (M = 4.05, SD =.699) and Technological Knowledge (TK) (M = 4.01, SD =.593), however, are also rated high, which implies that experienced teachers retain a good mastery of the subject matter and are acquainted with the educational technologies. Nevertheless, the combination of TK, PK, and CK in teaching demonstrates a comparatively lower mean score (M = 3.75, SD =.676) showing the lack of successful integration of technology, pedagogy, and content to form coherent teaching strategies. This group also exhibits greater pedagogical confidence levels compared to less experienced teachers but there is a difficulty in integrating technology and this can be an indication that there is a possible need in special professional development that emphasizes technology-mediated instruction in early childhood education.

Discussion and Main Conclusions

The current research was supposed to diagnose Technological Pedagogical Content Knowledge (TPACK) in teaching practice among early childhood teachers in the modern teaching methods, its general rates, gender disparity, and differences based on the teaching experience. The results show that teachers, overall, are highly competent in every TPACK domain as the mean scores are higher than the average score. The mean scores of Technological Knowledge (TK) were the highest in all groups (M = 4.01-4.20), which implies that teachers (independent of gender or experience) are sure about the usage of digital tools, as previous studies found that early childhood educators possess high levels of technological familiarity (Altun, 2019; Yang et al., 2023). The teachers who had more than 10 years of experience in the teaching profession recorded the highest amount of Pedagogical Knowledge (PK) (M = 4.22), as a result of being able to accrue knowledge on instruction strategies in the teaching profession, which is consistent with the report by Sofwatul Mala et al. (2025) that experienced teachers had strong pedagogical knowledge.

Content Knowledge (CK) was not significantly different between groups, and it confirms the previous studies that ECE teachers have a good command of subjects (Luo et al., 2022; Lim et al., 2023). It is important to note that the combination of TK, PK, and CK always had the lowest

mean scores (3.75--3.97) and illustrates a consistent difficulty in how to integrate technological, pedagogical, and content knowledge to create the appropriate teaching, in accordance with development. This is in line with the results of research by Zeng et al. (2022) and Novianti et al. (2025), who claim that teachers usually face difficulties with making TPACK operative even when their levels of individual knowledge are good.

In gender terms, female teachers were rated marginally higher in the scores of integration (M = 4.03) compared to male teachers (M = 3.83), and this indicates more effective integration of TPACK in classrooms, which is in tandem with the results of Kapici and Akcay (2023) who found gender effects on pedagogical integration of technology. In terms of experience, teachers with 6-10 years-experience showed a little higher overall mean of TPACK, and those with more than 10 years-experience are very good at PK but fail at integration, which means that the long years of experience in teaching reinforce the pedagogy but not necessarily lead to higher levels of technological integration.

Conclusions

- The early childhood teachers are well endowed with individual TK, PK, and CK, indicating competence in the lower realms.
- The combination of the technology, pedagogy and content could be an aspect to work on as well as it is a frequent issue in modern ECE.
- There is a minor difference in the integration of TPACK between female and male teachers, and this could imply the gender impact on teaching methods.
- The teachers in the mid-career (6-10 years) and highly experienced (>10 years) show balanced TPACK and stronger pedagogy and weaker technological integration, respectively, which is why it is necessary to focus on the coherent TPACK use, in particular, through professional development.

Recommendations

1. opportunities to offer specific professional learning *:Increase TPACK Integration* assist teachers in being able to incorporate technology, pedagogy and content in .developmentally sound practice in ECE
2. responsive mentorship -introduce gender *:Fair Technology use-Enhance Gender* .roduction of TPACK in all teachersand cooperative learning to enhance the int
3. Customize professional development with *:Differentiate Training by Experience* help novices learn how to use technology and experienced -teaching experience .aching contentteachers learn how to combine technology with instruction and te

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