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A Study on Professional Learning Community (PLC) Methods for Enhancing Pre-Service English Teachers' Quality in TPACK

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A B S T R A C T

Developing Technological Pedagogical Content Knowledge (TPACK) is crucial for pre-service English teachers, yet they often lack practical collaboration. This mixed-method study determines the implementation of Professional Learning Community (PLC) practices in fostering TPACK competency and identifies key challenges and best practices in their implementation. Data was collected using a Likert-Scale Questionnaire to measure perceptions of PLC and semi-structured interviews for in-depth experiences. The PLC model proved in building all TPACK components, evidenced by overwhelmingly positive perception scores: Technological Knowledge (TK) and Pedagogical Knowledge (PK) both averaged 94.28, and Content Knowledge (CK) averaged 90.49. This demonstrates increased confidence in integrating digital tools and successfully combining Technology, Pedagogy, and Content. The most successful practices identified were real-world application, structured group reflection, and professional guidance. However, the study identified the challenges, primarily related to time constraints for discussions and the need for improved post-session support. Furthermore, the PLC is a highly successful model for holistic TPACK development. By addressing the minor issues related to session timing and support, the already effective program can be further optimized for better success in transferring competencies to the classroom.

Keywords: *TPACK, Professional Learning Communities (PLC), Pre-Service English Teachers*

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INTRODUCTION

Teaching in modern schools places technology as an essential element of the learning process. To respond to this demand, teachers must be able to interrelate content knowledge, pedagogical knowledge, and technological knowledge (CK–PK–TK). Mishra and Koehler (2006) formulated the Technological Pedagogical Content Knowledge (TPACK) framework as a systematic methodology that helps teachers understand the intersections among these domains. TPACK has since been widely used in preservice teacher education programs to equip future teachers with the ability to teach effectively using technology (Chai, Koh, & Tsai, 2011).

Professional Learning Communities (PLCs) have long been recognized as an effective platform for continuous teacher development. PLCs emphasize collaborative learning, reflective practice, and shared teaching experiences (DuFour, 2004). For preservice English teachers, PLCs provide a structured environment in which they can explore new methods and experiment with technology-based instruction, thereby supporting the development of their TPACK (Schmidt et al., 2009).

Recent studies highlight the significant influence of TPACK on preservice teachers' teaching knowledge and practices. Schmidt et al. (2009) emphasize the need for structured programs to develop teachers' understanding of technology, pedagogy, and content simultaneously. Similarly, Koh et al. (2013) found that integrating TPACK principles into teacher education increases teachers' confidence and competence in using technology in the

classroom. Chai et al. (2011) further identify cooperative learning, reflective activities, and real teaching experiences as key strategies for strengthening TPACK.

Merely providing technology training, however, is not sufficient. Angeli and Valanides (2009) argue that preservice teachers must engage in authentic learning experiences that apply TPACK in real classroom contexts. This aligns with other findings showing that structured TPACK interventions significantly enhance teachers' readiness to use technology for instructional purposes (Schmidt et al., 2009). Consequently, preservice programs should treat TPACK not only as a theoretical framework but also as a practical pedagogical approach.

In this regard, PLCs play an important role by offering opportunities for teachers to share ideas, receive mentoring, and explore new teaching methodologies. Effective PLCs facilitate collaborative discourse, exchange of best practices, and ongoing evaluation of pedagogical decisions (DuFour, 2004). Vescio, Ross, and Adams (2008) further highlight that PLCs promote a culture of continuous improvement, making them suitable for supporting TPACK development among preservice teachers.

International research continues to validate the effectiveness of PLCs in enhancing TPACK. Hendrickx et al. (2025) show that collaborative knowledge building within PLCs strengthens teachers' technological and pedagogical abilities. Brown et al. (2018) emphasize the importance of structured collaboration for achieving pedagogical and technological advancement. In Indonesia, studies also confirm that PLCs improve instructional quality through knowledge sharing and collaborative professional learning.

Other recent research on TPACK integration suggests that structured TPACK courses significantly benefit preservice teachers. Koh and Chai (2016) found that TPACK-focused interventions improve teachers' readiness to integrate digital tools in classroom practice. Tseng, Chai, and Tan (2022) further report that collaborative learning environments facilitate the development of TPACK competencies. Despite these findings, there remains a lack of research specifically examining how PLCs support TPACK development among preservice EFL teachers.

Studies in Indonesia reinforce the potential of PLCs to enhance TPACK. Harjaya and Idawati (2022) highlight how PLCs support collaboration and leadership development in schools, allowing teachers to refine their pedagogy and integrate technology more effectively. Maharani et al. (2021) show that TPACK helps teachers address challenges in digital teaching, while Permana et al. (2016) note that PLC participation expands teachers' technological, pedagogical, and content knowledge. Accordingly, this study seeks to answer two questions: (1) How do PLC methods contribute to the development of preservice English teachers' TPACK? and (2) What challenges and best practices emerge in implementing PLC methods to improve TPACK competencies?

METHOD

In order to train future teachers, technology integration into EFL instruction is necessary. The TPACK (Technological Pedagogical Content Knowledge) framework provides a comprehensive understanding of the interactions among technology, pedagogy, and content in instruction. However, pre-service English teachers often have a difficult time developing TPACK competencies due to a lack of professional collaboration and experience. This study aims to determine how Professional Learning Community (PLC) practices will help pre-service English teachers to develop their Technological Pedagogical Content Knowledge (TPACK). In addition, the purpose of this study is to determine the barriers and best practices in the implementation of PLC practices. A mixed method study was employed to give a thorough understanding of its effect on the development of TPACK from participation in PLCs, collecting both quantitative and qualitative data. The quantitative component of the study included the Likert-Scale Questionnaire on PLC Participation. A Likert-scale questionnaire was used to assess the participants' perceptions regarding how their participation in PLCs affected their growth within TPACK. Several Likert-scale items were included on the questionnaire regarding the PLC practice to assess their improvement in

teaching pedagogy, increase in content knowledge and ability to integrate technology in instruction. Participants were instructed to respond to how strongly they agree or disagree with the statements on a scale from 1, strongly disagree to 5, strongly agree. To gain in-depth information of a group of certain participants regarding their own experiences with the PLC, semi-structured interviews were included in the qualitative data collection. The interviews concentrated on how PLC practices affected the participants' development of TPACK, especially how they incorporated pedagogy, technology, and content in their teaching practices. The semi-structured interviews also provided an opportunity to discuss challenges met in the PLC and how they were resolved.

FINDINGS AND DISCUSSION

This section presents and discusses the findings concerning the Professional Learning Community (PLC) activities on pre-service English teachers' technological knowledge perception. The data, primarily derived from a structured questionnaire, measures the extent to which participants felt about PLC in the relation of Technological Knowledge.

Table 1. The Questionnaire Results of Technological Knowledge Perceptions

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
PLC activities have taught me how to use technology in my English teaching in a way that works.	-	-	-	71,4%	28,6%
I feel more confident using technology tools to teach English now that I've been to PLC sessions.	-	-	28,6%	57,1%	14,3%
PLC talks have helped me figure out which technologies I can use to teach English.	-	-	-	57,1%	42,9%
Being a part of PLC activities has made me feel more confident about using digital tools in my lessons.	-	-	-	71,4%	28,6%
The PLC has shown me new tech tools that help me teach English better.	-	-	-	42,9%	57,1%

The responses of item "PLC activities have taught me how to use technology in my English teaching in a way that works" showed a consistently positive trend, with 71.4% of participants selecting "agree" and 28.6% selecting "strongly agree", while no one selected neutral or negative categories. This overwhelming agreement indicates that PLC sessions succeeded in helping pre-service English teachers understand *how* to integrate technology into their teaching in a pedagogically meaningful way.

This outcome is aligned with Mishra and Koehler's (2006) foundational TPACK model, which explains that teachers require structured environments to negotiate the interplay between technology, pedagogy, and content. Previous studies confirm that collaborative reflection and peer modeling strengthen teachers' TPACK formation (Schmidt et al., 2009; Koh & Chai, 2016).

In this item "I feel more confident using technology tools to teach English now that I've been to PLC sessions", 57.1% of respondents selected "agree", 14.3% selected "strongly agree", and 28.6% chose "neutral". The presence of a small neutral group suggests that although confidence is rising, not all participants feel fully secure with technology integration yet. This progression is typical in early TPACK development, where learners gradually move from awareness toward confident practice (Chai, Koh, & Tsai, 2013). Confidence growth is a direct outcome of collaborative professional learning, as PLCs offer hands-on guidance, peer support, and non-judgmental opportunities to practice new tools (Tseng, Chai, & Tan, 2022). The consistently positive responses reflect that the PLC reduced uncertainty and enhanced preservice teachers' self-efficacy; an effect also noted in Indonesian PLC research (Harjaya & Idawati, 2022; Maharani et al., 2021).

This item "PLC talks have helped me figure out which technologies I can use to teach English" shown 57.1% chose "agree", and 42.9% chose "strongly agree." This positive response indicates that the PLC provided clear, practical information about which technological tools are suitable for English teaching. It is highlighted that when preservice teachers share resources, demonstrate tools, and discuss real-world applications, they develop stronger, more targeted technological pedagogical knowledge (Koh & Chai, 2016; Fitria & Mustika, 2024). The high responses in strongly agree percentage here indicates that the PLC did more than simply introduce tools but also it helped participants decide which tools aligned best with English teaching needs, which is a highlight of maturing TPACK (Mishra & Koehler, 2006).

Like earlier items, "Being a part of PLC activities has made me feel more confident about using digital tools in my lessons" responses strongly positive 71.4% selected "agree", while 28.6% selected "strongly agree." This pattern shows that PLC participation strengthened not only the preservice teachers' knowledge but also their emotional readiness and willingness to use technology during instruction. Professional confidence is a significant component of successful TPACK development. Research consistently shows that PLCs cultivate a supportive culture in which teachers feel safe experimenting, receiving feedback, and improving their technological practice (Maisyaroh et al., 2021; Permana et al., 2016).

This final item "The PLC has shown me new tech tools that help me teach English better" received the 57.1% selecting "strongly agree" and 42.9% selecting "agree." It proves that every respondent perceived concrete value in the new technological tools introduced through PLC activities. Such a result aligns with literature describing PLCs as engines of innovation, particularly by encouraging teachers to explore, evaluate, and adopt new digital resources (Ardhi, Praptiwi, & Ernawati, 2024; Laeli et al., 2025). Within the TPACK framework, discovering new tools and being able to connect them with pedagogy and language-learning objectives is evidence of advancing technological knowledge (Mishra & Koehler, 2006). The dominance of strong agreement reflects that PLC meetings exposed participants to practical tools to accelerate the transfer of knowledge into teaching practice, a trend also emphasized by Schmidt et al. (2009).

This section presents and discusses the findings concerning the Professional Learning Community (PLC) activities on pre-service English teachers' Pedagogical Knowledge perception. The data, primarily derived from a structured questionnaire, measures the extent to which participants felt about PLC in the relation of Pedagogical Knowledge.

Table 2. The Questionnaire Results of Pedagogical Knowledge Perceptions

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
PLC sessions have helped me come up with better ways to use technology in my English lessons.	-	-	14,3%	71,4%	14,3%
Through PLC discussions, I've learned new ways to teach that help me use technology better in the classroom.	-	-	-	42,9%	57,1%
PLC activities have taught me how to change how I teach when I use technology in the classroom.	-	-	-	57,1%	42,9%
The PLC has given teachers useful tips on how to use technology while keeping the classroom running smoothly.	-	-	14,3%	71,4%	14,3%
PLC talks about teaching have helped me understand how to teach English well in a classroom with a lot of technology.	-	--		57,1%	42,9%

For the of Pedagogical Knowledge, the results indicate strong positive perceptions of how the PLC has supported teachers' pedagogical knowledge related to technology use in English language teaching. For the first statement, "PLC sessions have helped me come up

with better ways to use technology in my English lessons," the responses show that 71.4% agreed and 14.3% strongly agreed, with only 14.3% remaining neutral. This suggests that PLC participation directly contributes to teachers' ability to design technology-supported lessons; an outcome aligned with Mishra & Koehler's (2006) TPACK framework, which highlights the importance of integrating pedagogy and technology meaningfully.

For the second statement, "Through PLC discussions, I've learned new ways to teach that help me use technology better in the classroom," the perception is even stronger. 42.9% agreed and 57.1% strongly agreed, indicating that collaborative conversations play a central role in shaping practical teaching strategies. This aligns with DuFour's (2004) idea that professional learning communities encourage shared inquiry and continuous improvement, as well as Tseng et al. (2022), who found that collaborative learning enhances teachers' TPACK development.

On the third statement, "PLC activities have taught me how to change how I teach when I use technology in the classroom," 57.1% agreed and 42.9% strongly agreed. None of the respondents disagreed or felt neutral, showing a unanimous acknowledgment that PLC activities help teachers adapt their instructional approaches when integrating technological tools; consistent with findings from Koh & Chai (2016), who emphasized that teachers refine their pedagogical decisions when engaging in reflective, design-based collaborative work.

The fourth statement, "The PLC has given teachers useful tips on how to use technology while keeping the classroom running smoothly," shows a similar positive trend, with 71.4% agreeing and 14.3% strongly agreeing, while 14.3% remained neutral. These responses demonstrate how PLCs function as practical support systems that help teachers balance instructional management with technology use; an aspect supported by studies in Indonesian PLC contexts (Harjaya & Idawati, 2022; Permana et al., 2016).

Finally, for the fifth statement, "PLC talks about teaching have helped me understand how to teach English well in a classroom with a lot of technology," 57.1% agreed and 42.9% strongly agreed. Again, no disagreement was recorded, reinforcing the role of PLC as a space where teachers strengthen both pedagogical reasoning and technological confidence, in line with TPACK literature (Schmidt et al., 2009; Chai et al., 2013).

This section presents and discusses the findings concerning the Professional Learning Community (PLC) activities on pre-service English teachers' Content Knowledge perception. The data, primarily derived from a structured questionnaire, measures the extent to which participants felt about PLC in the relation of Content Knowledge.

Table 3. The Questionnaire Results of Content Knowledge Perceptions

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
PLC sessions have taught me new things about how to teach English, especially how to use technology in the classroom.	-	-	-	71,4%	28,6%
I have learned how to use technology in ways that make my teaching of English grammar and vocabulary better by taking part in PLCs.	-	-	-	85,7%	14,3%
PLC activities have helped me learn more about how to use technology to teach English subject.	-	-	14,3%	85,7%	-
PLC discussions have helped me come up with ways to use technology to teach language skills like listening, speaking, reading, and writing.	-	-	-	71,4%	28,6%
The PLC has helped me learn how to change what I know about English to keep up with new technologies in the classroom.	-	-	-	71,4%	28,6%
Being in PLC has really helped me get better at combining technology, pedagogical, and content knowledge.	-	-	14,3%	28,6%	57,1%

PLC has given me a great place to think about and improve how I use technology in my teaching.	-	-	14,3%	28,6%	57,1%
The PLC has helped me combine my knowledge of technology, teaching, and content, which has changed the way I teach English.	-	-	14,3%	42,9%	42,9%
I think that being a part of PLC has made me a better English teacher who can use technology in my lessons in a way that works well.	-	-	28,6%	42,9%	28,6%

For the Aspect of Content Knowledge, the first item "PLC sessions have taught me new things about how to teach English, especially how to use technology in the classroom" received consistently positive ratings, with 71.4% being "agree" and 28.6% being "strongly agree." The complete absence of neutral or negative ratings surely implies that there is a collective realization among this group that PLC sessions provided them with a novel perspective on instructing English with the help of technology. Such patterns are consistent with existing reports which describe PLCs as professional environments in which teachers collaboratively create and reshape understandings of the designated content through a mutual examination (Vescio et al., 2008; Laeli et al., 2025).

In the item "I have learned how to use technology in ways that make my teaching of English grammar and vocabulary better by taking part in PLCs", 85.7% chose "agree," while the correlative remainder of 14.3% selected "strongly agree." Here also there were no ratings above "strongly agree." The implications of this data suggest that, through participation in PLCs, teachers received a direct enhancement to their ability to instruct grammar and vocabulary using technological resources. Within the context of TPACK, this enhancement constitutes a development of the content delivery through technology (Mishra & Koehler, 2006), through the teachers' capacity for the association of specified content items with technological strategies.

In the item "PLC activities have helped me learn more about how to use technology to teach English subject", 85.7% of respondents opted for the rating of "agree," while 14.3% were in the category of "neutral". Although not as strong as the previous item, this rating pattern did imply that the most participants who responded derived some obvious benefit from PLCs, in that benefits for the understanding of how technology is able to assist in the instruction of literature was apparent. It is also suggestive in that earlier research has also shown that this group of teachers having the benefit from participation in PLCs which strip away perceived pedantic aspects of technical instruction by experience to new instruments of interpretation and to new technological resources and methods in connection with the multilayered consideration of the teaching of literature (Stover et al., 2022).

The item "PLC discussions have helped me come up with ways to use technology to teach language skills like listening, speaking, reading, and writing" received the approval of 71.4% that chose "agree," and 28.6% that opted "strongly agree." The results here suggest that PLC discussion is a valuable means of widening teachers' scope for technology applicable to the instructional sphere for all four of the language skills. PLCs supports the idea that professional collegial discussions, combined with modeling, generally lead to the kinds of innovative practice which relates to specific skills that teachers would not invoke in isolation (Ardhi et al., 2024).

The next item, "The PLC has helped me learn how to change what I know about English to keep up with new technologies in the classroom" show 71.4% "agree" and 28.6% confirming "strongly agree." The conclusions to be elicited from observations here again suggest that PLCs aided teachers reconstructing and reformulating existing knowledge of the content in times of formation of technology which were recently formed. This is consonant with Content Knowledge being a flexible concept, in the TPACK literature related to situational learning by teachers, in which a degree of reconstruction of understanding of all subject matter is required (Harris et al., 2009).

The item "Being in PLC has really helped me get better at combining technology, pedagogical and content knowledge," remains predominantly positive, with regard to respect to questions for teachers to consider in respect of the pedagogical and reflective value of this kind of professional education, with values of responses, 57.1% "strongly agree," 28.6% "agree," and 14.3% "neutral." The presence of neutral response here is indicative of different levels of comfort to make use of discussions associated with TPACK within in the entire sample. It indicates that nearly all the participants in the TPACK situations perceived a clear improvement in the integrations of TPACK quadrants during these phases, it suggested a certain minority may have needed more opportunities or more time to assimilate these thoughts into personal construct such a level of confidence does not translate into concrete reality. This, of course, necessitates another consideration in the another item of the entire experience of PLC participation for the content knowledge which is "PLC has given me a great place to think about and improve how I use technology in my teaching" that resulted in 57.1% "agree," 28.6% "strongly agree," and 14.3% "neutral." Teachers clearly viewed PLC as a good reflective opportunity for consideration what they had done within and without PLC situations in growth in their reflective methodology of considering their technology-supported programming instructional decisions, Parr (2020). Teacher professional learning research consistently shows that this kind of evaluative consideration made possible by communities of practice contribute to the depth of teachers' understanding of their content as well as the empower their reflection on confidently relevant choices of pedagogy. The results would be supportive of the findings of Darling-Hammond et al. (2017).

Responses to "The PLC has helped me combine my knowledge of technology, teaching, and content, which has changed the way I teach English" were distributed as follows: 42.9% said agree, 42.9% said strongly agree, 14.3% said neutral. The balance of agree and strongly agree indicates that most perceived substantial changes in their practices due to TPACK involvement. This goes along with literature indicating that collaboration driven by PLCs often produces transformational results, especially when teachers look at how pedagogy, content, and technology interact (Pella, 2021).

The last item "I think that being a part of PLC has made me a better English teacher who can use technology in my lessons in a way that works well" showed a distribution of 42.9% said agree, 28.6% said strongly agree, and 28.6% said neutral. Though more varied than some of the earlier items, again, the majority stated that participation in the PLC strengthened their identity and capabilities as English teachers able to integrate technology where needed. This point of view goes along with studies indicating that PLCs facilitate the development of teachers into more reflective, confident, evidence-based practitioners in the areas of both content and technology (Trust & Horrocks, 2019).

This section presents and discusses the findings concerning the Professional Learning Community (PLC) activities on pre-service English teachers' Primary Challenges in the Implementation of PLC Methods to Improve Pre-Service English Teachers' TPACK perception.

Table 4. The Questionnaire Results of Challenges in PLC

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I couldn't fully engage with the material because there wasn't enough time for in-depth discussions during PLC sessions.	-	42,9%	57,1%	-	-
The fact that PLC members had different levels of technological skills made it harder for them to work together.	-	28,6%	28,6%	28,6%	14,3%
It was hard to make the PLC sessions fit my specific teaching needs and interests.	14,3%	28,6%	42,9%	14,3%	-
PLC activities didn't always give me clear and useful advice on how to use technology in my teaching.	14,3%	57,1%	28,6%	-	-

The activities didn't work as well as they could have because the pace of the PLC sessions was either too fast or too slow.	14,3%	42,9%	28,6%	14,3%	-
It was hard for me to use the strategies and techniques we talked about in PLC sessions in my real teaching.	14,3%	28,6%	42,9%	14,3%	-
After PLC sessions, there wasn't always any follow-up support or guidance, which made it hard to put what was learned into practice.	28,6%	42,9%	**14,3%**	14,3%	-
Working with other teachers in the PLC sometimes caused misunderstandings or different ways of teaching.	-	14,3%	**28,6%**	57,1%	-

In the first item "I couldn't fully engage with the material because there wasn't enough time for in-depth discussions during PLC sessions", the responses were clustered completely toward the middle of the continuum, with 57.1 % selecting '3' and 42.9 % selecting '2', and no responses in agreement or strongly agree. While the item does not indicate any bad feeling about the situation, it does show a moderate perceived problem, in the matter that the respondents did feel that the PLC did not give sufficient time for depth of conceptual understandings. This is consistent with the argument by Dufour (2004) that PLCs become effective only where there is time available where there can be collective inquiry. Without such time, it is impossible for the teachers to explore the more complex ideas, such as the integrations of TPACK, which require a reflective dialogue (Mishra and Koehler, 2006). The moderate concern shown indicates that the preservice teachers required further structured time in which to discuss the new material in a collaborative manner.

In the item, "The fact that PLC members had different levels of technological skills made it harder for them to work together", the responses showed a variety in their responses: 28.6 % for '2', 28.6 % for '3', 28.6 %, for '4' and 14.3 % for '5'. This shows a wide distribution which indicates that while this is not a universal problem, it is generally considered a real problem by most of the respondents. This verifies the noted problem which comes out in the literature about TPACK: that the preservice teachers frequently have uneven technological readiness (Schmidt et al., 2009) which complicates the collaborative learning situations. When the teacher skills become slightly uneven, the group work becomes more laborious or possibly inefficient; this is also brought out by Tseng, Chai, and Tan (2022), who note that collaboration is a consideration for enhancing TPACK only so far as the base level technological competency is reasonably close.

In the item, "It was hard to make the PLC sessions fit my specific teaching needs and interests," 42.9 % marked neutral, 28.6 % selected 'disagree' and a smaller number of responses (14.3 % each) marked strongly disagree and agree. The wider distribution is in the middle range which indicates that the PLC contents were not completely fitted to the various teacher needs of pedagogy and content. In this instance the results are in agreement with those of Permana, Johar & Sudarsyah (2016), who note that PLC's have need of thorough facilitation to produce relevance across a variety of teaching situations to be successful. The preservice teachers in particular require distinctly different help, being that they are just beginning to develop their identities in teaching philosophy. When the PLC context is appearing to feel abstract, the TPACK process for development is to suffer as a result.

In the item "PLC activities didn't always give me clear and useful advice on how to use technology in my teaching". The responses revealed a majority (57.1 %) selecting disagree, with 28.6 % marking neutral and 14.3 % marking strongly disagree. No responses were recorded on the "agree" category. This indicates that many of the respondents did view that the help in some way was inadequate or not clear and refinable, but not a difficult problem by itself.

In the item "The activities didn't work as well as they could have because the pace of the PLC sessions was either too fast or too slow," the responses indicated that 42.9 % marked disagree while 28.6 % marked neutral, with 14.3 % in both the case of strongly disagree and agree. The wide distribution shows again a moderate but real problem, one with its

associations with the pace and flow-up of the instruction. This again checks with the observation of Ardhi, Praptiwi, and Ernawati (2024) that emphasize a need of the pace of learning if the participants in the commonly attended PLC are apt to be too different in their personal capacities for acquiring the needed knowledge.

In the item "After PLC sessions, there wasn't always any follow-up support or guidance, which made it hard to put what was learned into practice", the responses showed that 42.9 % marked disagree, 28.6 % marked strongly disagree and a smaller number of neutral (14.3 %) and agree (14.3 %). It indicates that the follow-up help was not consistently available to help, and did more to hinder the ability of the participants to do the things they learned in the TPACK follow-up discussion after the sessions were learned, and attempt them in the actual teaching. This emphasizes the choice made by Maisyaroh et al., (2021) who state that community participation models call for follow-up educational practice, mentoring and feedback which is succeeded over and over again.

In the item "Working with other teachers in the PLC sometimes caused misunderstandings or different ways of teaching", the largest proportion (57.1 %) selected agree, with 28.6 % selecting neutral and 14.3 % selecting disagree. This pattern of responses is indicative of the material presented by Harjaya and Idawati (2022), who noted that the whole activity of collaboration in the PLCs often met with some friction, when the collaborators had differing levels of grasping whatever it was that was intended.

This section presents and discusses the findings concerning the Professional Learning Community (PLC) activities on pre-service English teachers' best practices in implementing PLC to improve pre-service teachers' TPACK competence.

Table 5. The Questionnaire Results of Best Practices in PLC

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The best way for me to improve my TPACK skills is to plan lessons together with other people in PLC sessions.	-	-	42,9%	42,9%	14,3%
Getting helpful feedback from my peers during PLC sessions helped me get better at using technology in my teaching.	-	-	14,3%	71,4%	14,3%
Hands-on practice with technology tools during PLC activities was especially helpful for building my TPACK.	-	-	14,3%	57,1%	28,6%
During PLC sessions, reflective discussions helped me think critically about how I teach and find ways to make it better.	-	-	-	71,4%	28,6%
In PLC discussions, working with preservice teachers and teachers from different universities or backgrounds gave me useful information and different points of view.	-	-	-	57,1%	42,9%
PLC activities that were based on real-life teaching situations helped me put theory into practice and improve my TPACK.	-	-	-	71,4%	28,6%
Having mentors or teachers help me during PLC sessions helped me use new teaching methods well in my classroom.	-	-	14,3%	57,1%	28,6%
PLC sessions that let us work together to solve problems helped me deal with problems in my teaching better.	-	-	14,3%	71,4%	14,3%
PLC discussions that focused on the integration of both pedagogy and technology helped me develop a more	-	-	28,6%	57,1%	14,3%

balanced approach to teaching English.					
I found that using peer feedback in my teaching helped me a lot with my TPACK development.	-	-	-	57,1%	42,9%

The item "The best way for me to improve my TPACK skills is to plan lessons together with other people in PLC sessions" received very strong responses 42.9% "agree," 42.9% "strongly agree," and the remaining 14.3% "neutral". No teachers disagreed with this item. Overwhelmingly, participants felt that planning lessons collaboratively was a productive, motivating source of practice of skills for technology integration of pedagogy and content. This matches DuFour's (2004) discussion of PLCs as places where collaboration, rather than individual effort, drives professional growth. Collaborative design practices support TPACK, with teachers negotiating important pedagogical and technological decisions together (Mishra & Koehler, 2006; Chai, Koh & Tsai, 2013). The data presented here repeat Schmidt et al. (2009), who argue that applied and intimate activities speed the development of TPACK relative to study conducted in isolation.

The item "Hands-on practice with technology tools during PLC activities was especially helpful for building my TPACK" obtained 71.4% "agree" and 14.3% "strongly agree". That positive response indicates that feedback circles were another primary way that pre-service teachers remapped their practices when hiding misconceptions and assumptions. Feedback as a key constant feature of learning community is noted in almost all PLC literature (Harjaya & Idawati, 2022; Ardhi et al., 2024). The next item "Getting to use technology tools in PLC activities was particularly useful for my TPACK development" got 57.1% "agree" and 28.6% "strongly agree." This strongly confirms TPACK theory's claim that teachers must try out tools, not merely talk about them, in order to grasp their pedagogical affordances (Schmidt et al., 2009; Mishra & Koehler, 2006).

The item "During PLC sessions, reflective discussions helped me think critically about how I teach and find ways to make it better" received 71.4% of us selecting "agree" and28.6% "strongly agree". The value of reflection is stated in both PLC and TPACK Literature; Chai et al. (2013) note that teachers deepen TPACK understanding of their decisions in teaching by talking out and reflecting on them. The item "In PLC discussions, working with preservice teachers and teachers from different universities or backgrounds gave me useful information and different points of view" also showed 57.1% agreement. Participants did benefit from working with other teachers from different backgrounds, it appears and that is well-supported by PLC literature.

In the item "PLC activities that were based on real-life teaching situations helped me put theory into practice and improve my TPACK" also repeated this pattern, received 71.4% 'agree' and 28.6% 'strongly agree.' This finding shows one more time how powerfully the element of authenticity filled in PLC tasks strength of character helps strengthen TPACK readiness. For many pre-service teachers, having their learning of digital technologies mapped onto makers in pedagogical moves that are concretely in evidence in real cases in classroom have engaging opportunities.

The participant items "Having mentors or teachers help me during PLC sessions helped me use new teaching methods well in my classroom" obtained 57% agreement. Mentoring also comes to the fore in TPACK studies which turns out that mentoring is a good way to encourage pre-service teachers' strength of character about bridging and faking (Tseng et al., 2022). The respondents in the interview session agreed that their involvement in the PLC significantly broadened their perspective and understanding of how technology should be used in learning. They explained that previously they had only tended to view technology as a supplement, such as for displaying videos or creating presentations, but after engaging in discussions and collaboration, they began to realize that technology was not just a tool, but a learning strategy that could enhance students' engagement, comprehension, and autonomy. As an example, they mentioned that they used Canva for visual media development after receiving input in the PLC that students were highly responsive to appealing visuals, and they

now use it to create more engaging reading materials and vocabulary posters, as well as using YouTube for speaking warm-ups.

In the item " PLC sessions that let us work together to solve problems helped me deal with problems in my teaching better" received 71.4% on agree and 14.3% "strongly agree," indicating that troubleshooting problems collaboratively in PLCs is a consistently available serious PLC practice in schools. Problem solving reflects the inquiry-based nature of effective PLCs (DuFour, 2004) and works within the TPACK dance by teaching you teachers are likely to learn and answer about depending upon the complexity of specific classroom situations (Chai et al., 2013). It is aligned with the interview results that revealed when they working with colleagues in PLC meetings significantly helped improve their teaching, stating that through joint discussion and reflection, they gained many new perspectives on effective teaching methods. They highlighted that the most beneficial feedback came when a peer suggested they break down instructions into smaller steps, as students appeared confused by lengthy, simultaneous instructions. Furthermore, they received input regarding the use of nonverbal cues. They concluded that these suggestions would serve as vital evaluation material to make their classroom practice more focused, the class easier to manage, and students more actively involved in learning.

The item "PLC discussions that focused on the integration of both pedagogy and technology helped me develop a more balanced approach to teaching English" received 57.1% agreement and 14.3% strong agreement, with two neutral (28.6%) responses indicating that activities discussing or trying to explicitly link technology and pedagogy, indicating that not addressing them as separate was particularly powerful (Schmidt et al., 2009).

The item "I found that using peer feedback in my teaching helped me a lot with my TPACK development" also scored high, with 57.1% saying "agree" and 42.9% "strongly agree". Respondents must have all seen peer feedback as part of their learning. Peer feedback can be critical in determining success in students' TPACK development, and there is a pattern of reasons why it might. Within TPACK itself, we see that feedback helps the pre-service teacher to consider whether technological choices are appropriate to the learning that is being attempted through technology and the pedagogical decisions taken (Koh & Chai, 2016; Schmidt et al., 2009). The feedback as delivered following microteaching and real teaching practices in schools, where PLC members focused on designs done collaboratively, or peer sessions of technology practice, is one of the more valuable best practices when considering broader studies of supporting pre-service teachers' TPACK.

CONCLUSIONS

The data consistently demonstrates that the PLC has been highly effective in building the participants' Technological Knowledge (TK) component of the TPACK framework. Participants feel more confident and have acquired practical knowledge about using and integrating effective digital tools into their English lessons as a direct result of their involvement in the PLC activities. It is supported by the average score of perception that reaches 94,28. The results regarding the pre-service teachers' perception of Pedagogical Knowledge (PK) strongly indicate that the Professional Learning Community (PLC) activities were highly believed in enhancing their ability to integrate technology seamlessly into their teaching methods. It is supported by the average score of perception that reaches 94,28 as well. The findings presented in Table 3 strongly demonstrate the positive influence of the Professional Learning Community (PLC) on the pre-service teachers' Content Knowledge (CK) and, more crucially, their ability to successfully combine Technology, Pedagogy, and Content (TPACK) in teaching English. It is supported by the average score of perception that reaches 90,49. The issues about challenges are more related to challenges in timing and implementation. The results show that we need to make the sessions more relaxed, provide longer discussion times, and improve the support given after the sessions are over. If these small issues are resolved, this already very good PLC program for developing TPACK could become much more optimal and successful. The specific components of the Professional

Learning Community (PLC) that participants felt were most beneficial and successful in advancing their Technological Pedagogical Content Knowledge (TPACK) are strongly supported by the data in Table 5. The findings emphasize the importance of real-world application, group reflection, and professional guidance.

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