Indonesian ESP Teachers' Perceived TPACK: An Analysis of Competence Levels, Challenges, and Coping Strategies

Neneng Islamiah[1,2], Bambang Yudi Cahyono[1], Suharyadi[1], Evi Eliyanah[1], Muhamad Hasbi[1,3], Nurohman[1,4] & Rahmad Hidayat[1,5]

[1] Department of English, Faculty of Letters, Universitas Negeri Malang, Malang, Indonesia

[2] Department of English Education, Faculty of Teacher Training and Education, Universitas Islam Kalimantan MAB Banjarmasin, Banjarmasin, Indonesia

[3] English Education Department, Teacher Training and Education Faculty, Universitas Islam Negeri Salatiga, Salatiga, Indonesia

[4] SMK PGRI 2 Nganjuk, Indonesia

[5] English Education Department, Faculty of Teacher Training and Education (FKIP), Universitas Adi Buana PGRI Surabaya, Surabaya, Indonesia

Correspondence: Neneng Islamiah, Department of English, Faculty of Letters, Universitas Negeri Malang, Jl. Cakrawala No.5, Malang, East Java, 65145, Indonesia.

Received: November 4, 2025 Accepted: January 7, 2026 Online Published: April 10, 2026

doi:10.5430/wjel.v16n4p276 URL: https://doi.org/10.5430/wjel.v16n4p276

Abstract

This study investigates Indonesian English for Specific Purposes (ESP) teachers' Technological Pedagogical Content Knowledge (TPACK) to understand their perceived competencies and the challenges they encounter in integrating technology into ESP instruction, along with their coping strategies. Employing a mixed-methods design, data were gathered from 50 ESP teachers across Indonesian universities through a 35-item TPACK questionnaire and 6 selected participants, i.e., three with the lowest TPACK scores and three with the highest, through structured interviews. Quantitative data were analyzed using SPSS, while qualitative data were examined using NVivo. The findings indicate a clear imbalance in teachers' perceived knowledge domains: while ESP teachers expressed strong confidence in content and pedagogical areas, they reported considerably lower confidence in technology-related domains, particularly in achieving coherent integration of technology, pedagogy, and ESP content. The interview data further reveal that teachers encounter recurring challenges such as adapting to rapid technological change, providing technology-mediated feedback, contextualizing ESP instruction for professional practice, and designing multimedia and differentiated digital tasks. Although teachers demonstrate agency by adopting individual coping strategies, such as professional learning, experimentation with tools, and reflective practices, these efforts remain largely fragmented and dependent on personal initiative. This study contributes to the ESP–TPACK literature by providing a context-sensitive, mixed-method account of both competence patterns and integration struggles among in-service ESP teachers in Indonesia, highlighting the need for sustained, scaffolded professional development models that explicitly connect technology use with pedagogical reasoning and ESP-specific instructional goals.

Keywords: Challenges, Coping strategies, English for Specific Purposes (ESP), TPACK

1. Introduction

English for Specific Purposes (ESP) has become increasingly prominent in Indonesia, particularly in secondary and higher education, as it responds to learners' academic and professional needs rather than general language proficiency. This orientation aligns with national education policies that emphasize English for employability and disciplinary communication (Umar & Basuki, 2023). Despite this policy support, ESP implementation remains challenging. Indonesian ESP teachers continue to face longstanding pedagogical issues, including limited ESP-specific training, heterogeneous learner proficiency, and inadequate materials and assessment practices (Nabung & Guna, 2024; Poedjiastutie & Oliver, 2017). These challenges are now compounded by rapid digitalization, which requires teachers to integrate technology into ESP instruction despite uneven access, limited preparation, and increasing institutional expectations (Sari et al., 2025). As a result, ESP teachers are expected to simultaneously manage disciplinary content, pedagogical effectiveness, and technological integration under often constrained conditions (Muslimin et al., 2023; Syamdianita & Cahyono, 2021).

Empirical research on ESP practices in Indonesian higher education suggests that while technology-mediated and blended approaches are increasingly encouraged, teachers' readiness to implement them remains uneven. National and institutional studies show that many ESP lecturers support the idea of blended learning but report persistent technical barriers, limited institutional support, and low confidence in embedding digital tools into ESP materials in pedagogically meaningful ways (Mulyadi et al., 2020). Qualitative accounts further indicate that ESP teachers must continuously update disciplinary knowledge and adapt materials while working within constraints of infrastructure, time, and student preparedness, all of which directly affect their ability to integrate technology, pedagogy, and content coherently

(Mahendra, 2020). Research on CALL-related professional development reinforces this concern, showing that while training initiatives may improve teachers' technological awareness, they rarely address systemic constraints or support deeper pedagogical integration aligned with ESP goals (Kristiawan et al., 2022). Taken together, these findings suggest that the core issue is not merely access to technology, but teachers' capacity to integrate it meaningfully within ESP pedagogy and content.

Although the Technological Pedagogical and Content Knowledge (TPACK) framework has been widely adopted to examine such integration, significant gaps persist in its application to ESP contexts in Indonesia. Existing TPACK studies largely focus on general English, pre-service teachers, or STEM disciplines, with Indonesian research disproportionately concentrated in science and mathematics education (Sutimin et al. (2025) Within language education, systematic reviews highlight a recurring discrepancy between teachers' self-reported TPACK competence and their actual classroom practices, pointing to the need for more contextualized and qualitative inquiry (Kamal et al., 2025). While some Indonesian studies have measured perceived TPACK among in-service English teachers (e.g., Mahdum, 2015), they often treat TPACK as a single construct, overlook variation across the seven domains, and rarely explore how teachers respond to weaknesses in specific subcomponents. Critically, there remains a lack of mixed-methods research that links quantitative profiles of ESP teachers' TPACK with qualitative insights into the concrete challenges they face and the strategies they adopt to cope with them in practice.

Responding to these gaps, this study offers a focused and context-sensitive examination of Indonesian ESP teachers' perceived TPACK by explicitly addressing both competence levels and lived challenges. It investigates: (1) the distribution of Indonesian ESP teachers' perceived TPACK across its seven dimensions, and (2) the TPACK-related challenges teachers encounter and the strategies they apply to cope with them. By integrating a 35-item TPACK questionnaire with follow-up interviews centered on the lowest-scoring domains, this study moves beyond descriptive measurement to illuminate how ESP teachers experience, interpret, and navigate TPACK integration in real instructional contexts. In doing so, it contributes to the refinement of TPACK theory within ESP settings and provides empirically grounded insights to inform more targeted professional development and institutional support for ESP teachers in Indonesia.

2. Literature Review

2.1 English for Specific Purposes (ESP)

English for Specific Purposes (ESP) has evolved since the 1960s in response to global economic, scientific, and educational shifts that demanded more functionally oriented uses of English (Rahman, 2015). While foundational definitions emphasize ESP's focus on specific learner needs, disciplinary genres, and specialized methodologies (Dudley-Evans, 1998), later scholarship problematizes the practical realization of these principles in diverse instructional contexts. Although ESP is theoretically distinguished from general English through its reliance on needs analysis and authentic materials (Hasbi et al., 2025; Langhoff-Roos, 2016), translating needs-based insights into coherent curricula remains challenging due to institutional constraints and heterogeneous learner profiles. The claim that ESP teaches language associated with disciplines rather than disciplinary content itself (Dudley-Evans, 1998) further complicates material development, as teachers must balance linguistic focus with sufficient professional relevance. Moreover, while needs analysis is widely recognized as the cornerstone of ESP course design, encompassing target, present, and learning situations (Rahman, 2015), its cyclical and context-sensitive nature renders ESP curriculum development labor-intensive and difficult to standardize across settings (Mohamed & Alani, 2022). This tension underscores the persistent gap between ESP theory and classroom implementation.

Contemporary ESP pedagogy increasingly calls for innovative, learner-centered approaches to address these implementation challenges, yet such proposals often demand high levels of teacher expertise and institutional support. For instance, approaches incorporating translanguaging, heteroglossia, and corpus-based analysis aim to respond to multilingual and multiethnic classrooms Gvelesiani (2023), but they presuppose teachers' advanced linguistic and technological competencies. Similarly, the integration of experiential learning within principled pragmatism and constructivist frameworks promotes authentic language use in simulated or real-world contexts (Tarnopolsky & Kozhushko, 2020), though its success depends on careful instructional design and sustained reflection. While needs analysis remains central to motivating learners and aligning instruction with professional goals (Coancă, 2013), its effectiveness is contingent upon teachers' ability to interpret needs data pedagogically. The push toward competence-based, action-oriented, and blended-learning models further highlights the growing expectation that ESP teachers integrate technology meaningfully into instruction (Topuzov et al., 2020). Collectively, these perspectives suggest that while ESP pedagogy is increasingly sophisticated, its successful enactment hinges on teachers' capacity to integrate content, pedagogy, and technology coherently.

2.2 Technological Pedagogical and Content Knowledge (TPACK)

The Technological Pedagogical and Content Knowledge (TPACK) framework offers a conceptual lens to address such integration challenges by positioning technology as an inseparable component of pedagogical and content decision-making (Herring et al., 2006) Mishra & Koehler, 2006). The rapid expansion of TPACK research, evidenced by global publication trends between 2011 and 2020, reflects a growing shift from conceptual discussions toward practical strategies for technology-enhanced teaching (Lee et al., 2022). This shift was further accelerated by the COVID-19 pandemic, which exposed the urgency of teachers' capacity to enact TPACK in emergency remote teaching contexts (Helingo & Nurpahmi, 2024). However, despite increased scholarly attention, TPACK remains a complex construct, particularly in language education, where integration must account for linguistic, communicative, and contextual demands (Ilahude et al., 2023). The proliferation of themes such as video-based projects and online professional development suggests progress, yet also reveals ongoing struggles with operationalizing TPACK in authentic instructional settings.

Empirical studies in English language teaching further illustrate the disjunction between perceived competence and actual classroom practice. While higher-education lecturers may report high levels of self-perceived TPACK, technology integration often remains superficial or inconsistent (Quach et al., 2024), pointing to limitations of self-assessment and structural constraints. In ESP-specific contexts, findings that teachers master certain TPACK subdomains but struggle with pedagogical content integration (Mulyadi et al. (2020) highlight the heightened complexity of aligning technology with discipline-specific language instruction. Systematic reviews confirm that much of the TPACK literature focuses on measurement rather than pedagogical transformation (Lim et al., 2021), suggesting an overemphasis on competence levels at the expense of contextualized enactment. Furthermore, the relative scarcity of TPACK studies in EFL compared to STEM fields (Anjarani, 2020) underscores the need for domain-sensitive research that accounts for the unique demands of ESP teaching. Together, these insights suggest that advancing TPACK in ESP requires not only technological access but also sustained pedagogical support and contextualized professional development.

3. Method

3.1 Research Design

This study adopted an explanatory sequential mixed-methods design to examine Indonesian English for Specific Purposes (ESP) teachers' perceived Technological Pedagogical Content Knowledge (TPACK) and to explore the challenges they encounter and the strategies they employ in integrating technology into ESP instruction. In line with established mixed-methods procedures, quantitative data were collected and analyzed first, followed by qualitative data to explain and elaborate on the survey results (Cresswell, 2012). In particular, an explanatory sequential design was applied: the quantitative phase (questionnaire) was conducted first, followed by a qualitative phase (interviews) to explain and elaborate on the quantitative results. This design was selected to ensure that qualitative inquiry was empirically grounded in patterns identified in the questionnaire findings.

3.2 Participant (Subject) Characteristics

The quantitative phase involved 50 ESP teachers from universities across Indonesia. Participant demographics (gender, education level, teaching experience, and teaching location) were collected to describe the sample's diversity and representativeness, rather than for inferential comparison. From this pool, six teachers were purposively selected for the qualitative phase: three with the lowest overall TPACK scores to explore challenges and three with the highest scores to explore coping strategies. This maximum-variation sampling approach enabled contrastive analysis of TPACK-related challenges and coping strategies across differing competence levels.

3.3 Instruments

Data were collected using a TPACK questionnaire and a semi-structured interview protocol. Adapted from the TPACK framework Herring et al. (2006), the questionnaire comprised 35 items representing seven domains (CK, PK, TK, PCK, TCK, TPK, and TPACK). Each domain was measured by five items rated on a four-point Likert scale (1 = *strongly disagree* to 4 = *strongly agree*), capturing teachers' self-perceived competence in ESP contexts. This quantitative data was analyzed using the Statistical Package for the Social Sciences (SPSS) to calculate the mean scores across the seven TPACK dimensions. The resulting mean scores were then classified into four categories: *very positive* (3.26–4.00), *positive* (2.51–3.25), *negative* (1.76–2.50), and *very negative* (1.00–1.75).

The interview protocol was developed based on the quantitative results. One item with the lowest mean score from each TPACK domain was selected to guide the interviews, i.e., items 3 (TK), 10 (PK), 13 (CK), 20 (TPK), 24 (TCK), 27 (PCK), and 34 (TPACK). Interviews focused on identifying domain-specific challenges and exploring strategies used to address them. Teachers with lower TPACK scores primarily discussed challenges, while those with higher scores provided insights into coping strategies, enabling triangulated perspectives.

3.4 Procedure

Data collection proceeded in two phases. Questionnaire data were collected online during the first phase of the study. Descriptive statistical analysis was conducted to determine mean scores for each TPACK domain and to identify the lowest-scoring items. Based on these results, interview questions were refined, and selected participants were invited to take part in follow-up interviews. This sequential procedure ensured methodological coherence between quantitative and qualitative phases.

3.5 Data Analysis

Quantitative data were analyzed using SPSS to generate descriptive statistics for each TPACK dimension (Hair et al., 2018). Internal consistency reliability was assessed using Cronbach's alpha, resulting in coefficients ranging from 0.702 to 0.827, which indicated satisfactory reliability across all seven dimensions. It onfirms the instrument's suitability for measuring multidimensional TPACK constructs (Tavakol & Dennick, 2011). Meanwhile, qualitative interview data were transcribed verbatim and analyzed using NVivo. A thematic analysis approach was applied, involving open coding to identify initial categories, axial coding to establish relationships among categories, and selective coding to synthesize overarching themes related to challenges and coping strategies within each TPACK domain. Integration of quantitative and qualitative findings occurred at the interpretation stage to enhance analytical depth and validity.

4. Results

4.1 The Scores of Indonesian ESP Teachers' Perceived TPACK across Its Seven Domains

The results of the analysis of the questionnaire on the scores of Indonesian ESP teachers' perceived TPACK across seven domains are shown in Figure 1.

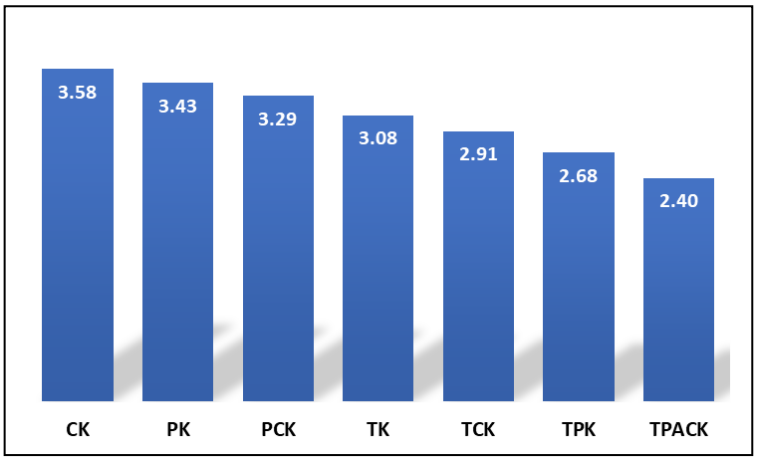

Figure 1. The Mean of Each TPACK Domain

The quantitative findings, as shown in Figure 1, indicate distinct variations in Indonesian ESP teachers' perceived competence across the seven TPACK dimensions. The highest mean was recorded for Content Knowledge (CK = 3.58), followed by Pedagogical Knowledge (PK = 3.43) and Pedagogical Content Knowledge (PCK = 3.29). These three dimensions fall within the very positive category on the Likert scale, suggesting that the participants possess strong confidence in mastering subject matter knowledge, applying sound pedagogical principles, and integrating pedagogy with content knowledge. In contrast, Technological Knowledge (TK = 3.08), Technological Content Knowledge (TCK = 2.91), and Technological Pedagogical Knowledge (TPK = 2.68) were rated moderately, falling within the positive category. These results indicate that while teachers show basic familiarity and willingness to employ technology, they still experience limitations in applying it effectively to support ESP-specific instruction. The lowest mean was found in Technological Pedagogical Content Knowledge (TPACK = 2.40), categorized as negative, albeit only 0.10 points below the positive threshold. This score highlights a major challenge in integrating technology, pedagogy, and content cohesively to design ESP learning experiences that reflect authentic workplace contexts.

Table 1. Questionnaire Statement in Each TPACK Domain with Lowest Score

No.	TPACK Domain	Question With Lowest Score in Each Domain	Mean	Score Category
1.	TK	*I adapt quickly when new technologies are introduced in the context of ESP teaching. (No.3)*	3.00	Positive
2.	PK	*I can provide constructive feedback that helps ESP students improve their learning. (No.10)*	3.38	Very positive
3.	CK	*I can teach ESP content in a real-world professional context. (No.13)*	3.50	Very positive
4.	TPK	*I can use technology to differentiate learning based on the needs of ESP students. (No.20)*	2.62	Positive
5.	TCK	*I can create ESP-related multimedia materials using technology. (No.24)*	2.76	Positive
6.	PCK	*I can design classroom activities that connect ESP content to professional practice. (No.27)*	3.14	Positive
7.	TPACK	*I can adapt my ESP teaching to create a balance between pedagogy, content, and technology. (No.34)*	2.26	Negative

The results displayed in Table 1 highlight the lowest-scoring statements within each TPACK domain, offering a closer look at specific aspects of ESP teachers' perceived challenges. Overall, the data show that while Pedagogical Knowledge (PK = 3.38) and Content Knowledge (CK = 3.50) remain the strongest areas, both categorized as very positive, the other domains reflect only positive or even negative perceptions. Teachers rated Technological Knowledge (TK = 3.00) and Pedagogical Content Knowledge (PCK = 3.14) positively, suggesting moderate ability to adapt to new technologies and design classroom activities linking ESP content with professional practice. However, Technological Pedagogical Knowledge (TPK = 2.62) and Technological Content Knowledge (TCK = 2.76) were relatively low, indicating that teachers find it difficult to differentiate learning or develop multimedia materials that address ESP students' specific needs. The most critical issue appears in Technological Pedagogical Content Knowledge (TPACK = 2.26), the only domain categorized as negative, showing that many teachers still struggle to harmonize technology, pedagogy, and content in ESP instruction. These seven lowest-scoring statements were then used as the main topics in the interview phase, which aimed to explore the challenges faced by ESP teachers with lower TPACK competence and how these challenges are addressed by those with higher TPACK competence.

Table 2. ESPTs with Lowest and Highest Score (The Interview Respondents)

No.	Respondent	Questionnaire Mean	Interview Type
1	ESPT 16	2.43	Challenges Interview
2	ESPT 12	2.46	
3	ESPT 14	2.46	
4	ESPT 21	3.29	Coping Strategies Interview
5	ESPT 39	3.31	
6	ESPT 22	3.40	

Table 2 presents six ESP teachers, including three with the lowest and three with the highest means from the TPACK questionnaire, who were purposively selected as respondents for the qualitative interview phase. Three participants, namely ESPT 16 (2.43), ESPT 9 (2.46), and ESPT 12 (2.46), were identified as the lowest scorers, forming the challenges analysis group. Their relatively low means indicate limited confidence in integrating technology with pedagogy and content, making them suitable for exploring the specific barriers and difficulties experienced in implementing TPACK within ESP instruction. Conversely, the other three participants, including ESPT 21 (3.29), ESPT 39 (3.31), and ESPT 22 (3.40), represented the highest scorers, comprising the coping strategies analysis group. Their consistently high scores suggest strong perceived competence in technological, pedagogical, and content integration, thus offering valuable insights into effective strategies, adaptive behaviors, and institutional or personal factors that support successful TPACK enactment. Together, these two contrasting groups enabled a balanced qualitative analysis, providing a deeper understanding of both the challenges faced by less proficient teachers and the adaptive solutions employed by more confident practitioners in Indonesian ESP contexts.

4.2 TPACK-Related Problems Faced by the Indonesian ESP Teachers and Their Coping Strategies

The results of the interviews on the challenges and corresponding coping strategies across the seven TPACK dimensions are shown in Table 6. While each *Challenge* interviewee identified one specific factor that was problematic within each TPACK domain, the *Coping Strategies* interviewees were invited to respond to all the identified challenges. However, for clarity and conciseness, only the most representative response for each challenge is included in the report. As a result, a *Coping Strategies* respondent may appear multiple times within one TPACK domain or, in some cases, not appear at all.

Table 3. Interview Results on ESPTs' Challenges and Coping Strategies

No.	TPACK Domain	Referred Questionnaire Statement	Challenges	Coping Strategies
1.	TK	*Questionnaire Statement.No.3*	Limited digital literacy for new tools (ESPT 16)	Join CPD workshops on new tech (ESPT 21)
			Resistance to frequent technological change (ESPT 12)	Encourage trial-based tech adaptation (ESPT 22)
			Lack of institutional training and support (ESPT 14)	Request regular institutional tech training (ESPT 39)
2.	PK	*Questionnaire Statement.No.10*	Difficulty designing formative feedback aligned with ESP goals (ESPT 16)	Use ESP-aligned rubrics (ESPT 21)
			Time constraints in providing individualized comments (ESPT 12)	Apply audio feedback tools (ESPT 21)
			Limited awareness of feedback-driven learning (ESPT 14)	Add reflection tasks for students (ESPT 22)
3.	CK	*Questionnaire Statement.No.13*	Insufficient exposure to authentic workplace materials (ESPT 16)	Use real-world ESP case studies (ESPT 39)
			Gap between academic ESP syllabi and professional practices (ESPT 12)	Align lessons with job demands (ESPT 22)
			Limited collaboration with industry professionals (ESPT 14)	Invite industry speakers to class (ESPT 22)
4.	TPK	*Questionnaire Statement.No.20*	Inability to customize digital tasks for varied proficiency levels (ESPT 16)	Apply adaptive online learning tools (ESPT 39)
			Lack of knowledge on adaptive learning tools (ESPT 12)	Attend digital pedagogy workshops (ESPT 21)
			Limited digital infrastructure to support personalization (ESPT 14)	Use low-bandwidth tech tools (ESPT 21)
5.	TCK	*Questionnaire Statement.No.24*	Limited multimedia design skills (ESPT 16)	Learn basic video-editing apps (ESPT 22)
			Lack of access to editing tools and software (ESPT 12)	Utilize open-source multimedia tools (ESPT 39)
			Overreliance on text-based resources (ESPT 14)	Add visuals and infographics (ESPT 22)
6.	PCK	*Questionnaire*	Difficulty contextualizing activities for specific	Create workplace simulation tasks

		Statement.No.27	professional domains (ESPT 16)	(ESPT 21)
			Lack of updated occupational knowledge (ESPT 12)	Read current industry sources (ESPT 39)
			Overemphasis on language accuracy over communicative practice (ESPT 14)	Focus on communicative activities (ESPT 39)
7.	TPACK	*Questionnaire Statement.No.34*	Fragmented understanding of TPACK integration (ESPT 16)	Reflect on TPACK-linked lessons (ESPT 22)
			Overemphasis on technology without pedagogical coherence (ESPT 12)	Prioritize pedagogy over technology (ESPT 21)
			Limited reflective practice in lesson planning (ESPT 14)	Keep digital teaching journal (ESPT 39)

The interview results in Table 3 reveal a range of challenges and corresponding coping strategies across the seven TPACK dimensions. In the TK domain, teachers reported limited digital literacy, resistance to constant technological change, and insufficient institutional support, which they addressed through continuous professional development, experimentation with new tools, and advocating for structured training.

"*I usually join CPD workshops to learn about new educational technologies*." (ESPT 21)

*"I try to handle frequent technological changes by testing new tools little by littl*e." (ESPT 22)

"I often ask my institution to organize regular training programs on educational technology." (ESPT 39)

In PK, difficulties in providing ESP-aligned formative feedback and managing time were mitigated through rubric-based evaluation, use of audio feedback tools, and reflection tasks.

"*To make my feedback more structured and relevant, I use ESP-aligned rubrics*." (ESPT 21)

"*I save time by using audio feedback tools to respond to students*." (ESPT 21)

"*I ask my students to do reflection tasks so they can learn from my feedback*." (ESPT 22)

For CK, teachers struggled with the lack of authentic materials and real-world relevance, coping by integrating case studies, aligning lessons with workplace demands, and inviting industry experts.

"*I bring in real-world ESP case studies to make lessons more practical*." (ESPT 39)

"*I adjust my lessons so they are more relevant to students' future jobs*." (ESPT 22)

"*To give students real insights, I invite industry speakers to my classes*." (ESPT 22)

Within TPK, the main issues were adapting digital tasks, limited tool knowledge, and weak infrastructure, addressed by using adaptive online tools, attending digital pedagogy workshops, and choosing low-bandwidth technologies.

"*To meet students' varied needs, I use adaptive online learning tools*." (ESPT 39)

"*I improve my skills by attending online workshops on digital pedagogy*." (ESPT 21)

"*I use low-bandwidth tools that still work even when the internet is slow*." (ESPT 21)

In TCK, teachers faced challenges in multimedia design and resource access, which they countered through basic video-editing training, open-source tools, and adding visuals.

"*I learned some basic video-editing skills to improve my materials*." (ESPT 22)

"*I use open-source multimedia tools that are free and easy to use*." (ESPT 39)

"*I try to make lessons more visual by adding pictures and infographics*." (ESPT 22)

PCK challenges included contextualizing ESP activities, outdated occupational knowledge, and focus on accuracy over communication, managed through simulation tasks, industry reading, and communicative approaches.

"*I design simulation tasks that represent real workplace situations*." (ESPT 21)

"*I keep myself updated by reading current industry materials*." (ESPT 39)

"*I've shifted my focus to more communicative and task-based activities*." (ESPT 39)

Finally, in the TPACK domain, fragmented integration, technological overemphasis, and limited reflection were overcome by reflecting on lesson design, prioritizing pedagogy, and maintaining a digital teaching journal.

"*I reflect on my lessons to understand how to balance those three aspects*." (ESPT 22)

"*I remind myself to focus more on pedagogy rather than the tools*." (ESPT 21)

"*To reflect on what works and what doesn't, I keep a digital teaching journal*." (ESPT 39)

5. Discussion

5.1 Distribution of Indonesian ESP Teachers' Perceived TPACK across Its Seven Dimensions

The pattern of results suggests a persistent imbalance in ESP teachers' perceived knowledge domains: while they feel quite confident in Content Knowledge (CK), Pedagogical Knowledge (PK), and Pedagogical Content Knowledge (PCK) (all scoring above 3.2), their confidence declines when it comes to technology-related domains (TK, TCK, TPK) and reaches a nadir in full TPACK integration (2.40). This gradient implies that teachers may understand what to teach and how to teach, but struggle with how to teach using technology in contextually coherent ways (Ginting et al., 2022). Also, EFL teachers have typically rated their competence higher in traditional domains (CK, PK, PCK) compared to technology-integrated domains (TK, TCK, TPK, TPACK) (Aniq & Drajati, 2019). The fact that TPACK is the lowest suggests that even when teachers have moderate technological knowledge or content and pedagogical understandings, they may lack the synergistic capacity to combine them meaningfully. This echoes broader critiques that TPACK integration is more complex than simply adding technology to pedagogy and content (Zeng et al., 2022). In practice, this means that interventions or training focusing only on technology or pedagogy in isolation risk failing; to bridge the gap, professional development must support contextual, integrated technology–pedagogy–content design rather than fragmented skill training (Cahyono et al., 2023).

The distribution of Indonesian ESP teachers' perceived TPACK shows that CK, PK, and PCK fall within the very positive category, indicating strong confidence in core instructional competencies. High CK suggests that ESP teachers feel well-equipped to master and explain discipline-specific content, which is a foundational requirement for credibility in ESP classrooms (Ashurovich, 2025). Similarly, the strong PK scores reflect teachers' confidence in managing classrooms, designing lessons, and applying pedagogical strategies effectively, competencies that are often developed through sustained teaching experience rather than technology exposure (Khanahmadi, 2025). The very positive PCK results further indicate that teachers perceive themselves as capable of aligning ESP content with appropriate pedagogical approaches, enabling meaningful learning experiences. This pattern aligns with broader TPACK research showing that teachers typically demonstrate stronger confidence in non-technological domains (Muslimin et al., 2024). In ESP contexts, this strength is particularly important because instructional effectiveness depends heavily on content relevance and pedagogical appropriateness (Mohamed & Alani, 2022). Overall, the dominance of CK, PK, and PCK suggests that Indonesian ESP teachers possess a solid professional foundation that supports language teaching within specific disciplinary contexts.

In contrast, TK, TCK, and TPK are categorized as positive rather than very positive, indicating moderate confidence in technology-related domains. The TK results imply that while teachers are generally familiar with digital tools, they may struggle to adapt quickly to rapid technological changes or to explore advanced applications (Zaim et al., 2025). Similarly, the TCK scores suggest limitations in using technology to represent ESP content through multimedia or digital simulations, a challenge frequently reported in ESP and EFL contexts (Muslimin et al., 2024). The relatively lower TPK scores indicate difficulties in using technology to support pedagogical strategies such as differentiation, feedback, or learner-centered instruction. These findings reflect a common trend in TPACK research, where teachers' technological integration lags behind their pedagogical and content expertise (Kamal et al., 2025). Institutional constraints, limited professional development, and uneven access to digital infrastructure further exacerbate these challenges (Helingo & Nurpahmi, 2024). As a result, technology tends to be used as a supplementary tool rather than an integral component of ESP pedagogy. This suggests that while teachers are willing to engage with technology, they require more structured and context-specific support to strengthen technology-informed instructional practices.

The most critical finding emerges in the Technological Pedagogical Content Knowledge (TPACK) domain, which falls into the negative category, highlighting substantial difficulty in fully integrating technology, pedagogy, and content. This low score suggests that possessing isolated technological, pedagogical, or content knowledge does not automatically translate into coherent instructional integration. In ESP contexts, TPACK integration is particularly complex because teachers must simultaneously address language, disciplinary content, and professional authenticity (Khanahmadi, 2025). The negative TPACK result indicates that teachers may use technology inconsistently or without clear pedagogical alignment, reducing its instructional impact. Similar findings have been reported in recent studies, which argue that TPACK represents a higher-order competence requiring sustained reflection and contextualized practice rather than short-term training (Budianto et al., 2023). The gap at the TPACK level underscores the need for professional development that emphasizes design-based, integrative approaches rather than tool-focused workshops (Kamal et al., 2025). Consequently, the distribution across the seven dimensions reveals a clear gradient, from strong pedagogical and content foundations to weaker integrative competence, pointing to TPACK integration as the central developmental challenge for Indonesian ESP teachers.

The overal findings reveal that Indonesian ESP teachers exhibit an uneven distribution of competence across the seven TPACK domains, with clear disparities between pedagogical–content mastery and technology-related integration. The consistently high scores in CK (3.50) and PK (3.38) align with previous studies emphasizing that ESP teachers tend to prioritize subject expertise and pedagogical techniques over technology-mediated instruction (Rahimi & Pourshahbaz, 2019). In contrast, the lower means for TPK (2.62), TCK (2.76), and especially TPACK (2.26) indicate that teachers continue to face systemic barriers in synthesizing technology with pedagogy and ESP-specific content. This pattern mirrors global findings where technology integration competence lags behind other domains due to insufficient digital training, limited institutional support, and low self-efficacy (Çalik & Mirici, 2024). The gap also reflects the complex cognitive demand of achieving TPACK coherence, as effective integration requires not only tool familiarity but also contextualized pedagogical reasoning (Brianza et al., 2022).

5.2 TPACK-related Challenges and the Coping Strategies

The interview findings indicate that Indonesian ESP teachers face persistent Technological Knowledge (TK) challenges, particularly limited digital literacy, resistance to frequent technological changes, and insufficient institutional training. These issues reflect broader patterns in higher education, where teachers often struggle to keep pace with rapidly evolving technologies without structured professional support (Khanahmadi, 2025). To cope with these challenges, teachers reported participating in continuous professional development workshops, experimenting with new tools incrementally, and advocating for institutional training programs (Quach et al., 2024). While these strategies demonstrate individual agency, prior research suggests that without sustained institutional investment, such efforts may result in only superficial technological adaptation rather than long-term competence development.

In the Pedagogical Knowledge (PK) domain, ESP teachers reported difficulties in designing formative feedback aligned with ESP objectives, managing time for individualized feedback, and fostering students' awareness of feedback-driven learning. These challenges align with research showing that ESP contexts demand more specialized and goal-oriented feedback practices than general English instruction (Gozali & Cahyono, 2022). Teachers attempted to address these issues by using ESP-aligned rubrics, audio feedback tools, and reflective tasks to promote learner engagement with feedback (Zaim et al., 2025). Although these strategies are pedagogically sound, studies caution that their effectiveness depends on teachers' assessment literacy and manageable teaching loads.

Content Knowledge (CK) challenges emerged in relation to limited access to authentic workplace materials, misalignment between academic syllabi and professional practices, and weak collaboration with industry professionals. Such constraints are widely documented in ESP research, which emphasizes the difficulty of maintaining up-to-date disciplinary relevance in rapidly changing professional fields (Ashurovich, 2025). To cope with these challenges, teachers reported using real-world case studies, aligning lessons with job-market demands, and inviting industry speakers into the classroom. While these approaches enhance authenticity, a previous study noted that sustained industry–academic partnerships are necessary to ensure long-term curricular relevance rather than ad hoc solutions (Lehiste, 2015).

Technological Pedagogical Knowledge (TPK) challenges centered on teachers' inability to differentiate digital tasks for diverse proficiency levels, limited familiarity with adaptive learning tools, and inadequate digital infrastructure. These findings resonate with research indicating that pedagogical use of technology is often constrained not by attitudes but by limited design knowledge and infrastructural inequities (Çalik & Mirici, 2024). Teachers addressed these challenges by adopting adaptive online platforms, attending digital pedagogy workshops, and selecting low-bandwidth technologies suitable for local contexts. However, it is suggested that without pedagogically grounded training, adaptive technologies may be underutilized or applied in ways that do not fully support differentiated learning (Tarnopolsky & Kozhushko, 2020).

In the Technological Content Knowledge (TCK) domain, ESP teachers reported limited multimedia design skills, restricted access to editing software, and overreliance on text-based instructional materials. These challenges mirror global findings that language teachers often lack training in content-specific multimedia production despite increasing expectations for digital materials (Khanahmadi, 2025). Teachers attempted to overcome these limitations by learning basic video-editing applications, using open-source tools, and incorporating visuals and infographics into lessons (Zaim et al., 2025). While these strategies support incremental improvement, research highlights that effective TCK development requires structured design-oriented training rather than solely tool-based learning.

Pedagogical Content Knowledge (PCK) challenges involved difficulties in contextualizing activities for specific professional domains, outdated occupational knowledge, and an overemphasis on linguistic accuracy at the expense of communicative practice. These issues reflect longstanding concerns in ESP teaching, where balancing language form and professional function remains complex (Ashurovich, 2025). Teachers addressed these challenges by designing workplace simulation tasks, consulting current industry sources, and prioritizing communicative activities. Although these practices align with ESP principles, studies argue that sustained curriculum renewal and reflective practice are essential to prevent ESP instruction from reverting to general language teaching norms (Gozali & Cahyono, 2022).

At the integrative TPACK level, teachers reported fragmented understanding of technology–pedagogy–content integration, overemphasis on technology without pedagogical coherence, and limited reflective lesson planning. These challenges support critiques that TPACK integration is cognitively demanding and cannot be achieved through isolated skill acquisition (Brianza et al., 2022). Teachers attempted to cope by reflecting on TPACK-linked lessons, prioritizing pedagogy over technology choices, and maintaining digital teaching journals. While reflective practices are widely endorsed, recent research stresses that individual reflection must be complemented by collaborative and institutional support to foster sustained and coherent TPACK development (Khanahmadi, 2025).

These findings provide an illuminating look at how ESP teachers contend with domain-specific challenges and the practical strategies they employ, but they also raise critical questions about sustainability and depth. Across the seven TPACK dimensions, teachers reported low digital literacy, resistance to constant tech change, and lack of institutional support in TK, which they attempt to address through workshops, experimentation, and calls for formal training. In PK, they struggle with aligning feedback to ESP goals under tight time constraints and limited feedback awareness, leading them to adopt rubrics, audio tools, and reflection prompts. In CK, the mismatch between academic syllabi and real-world workplace contexts is mitigated by using case studies and guest speakers. For TPK, customization challenges, lack of adaptive tool knowledge, and weak infrastructure push teachers toward adaptive tools, workshops, and low-bandwidth options. On TCK, deficiencies in multimedia design and resource access are met with basic editing training, open-source tools, and visual infographics. In PCK, they struggle to contextualize ESP activities and overemphasize accuracy over communication,

countering those with simulation tasks, current industry reading, and communicative approaches. Finally, at the integrative TPACK level, fragmented integration and limited reflection are addressed through lesson reflection, pedagogical prioritization, and keeping a digital teaching journal.

While these strategies indicate resourcefulness, they largely remain patchwork solutions rather than systemic interventions, which may be insufficient for deep transformation. Many of the coping measures depend on individual initiative rather than institutional change, leaving persistent structural barriers unaddressed, such as organizational support, infrastructure, teacher workload, and conceptual clarity about TPACK (Muslimin et al., 2024). The reliance on self-driven professional development echoes critiques that TPACK is often operationalized as a set of ad hoc strategies rather than a cohesive epistemic framework (Mackinnon, 2017). Moreover, the context of ESP teaching, with its domain specificity and professional stakes, demands more than generic technology or pedagogy training (Gozali & Cahyono, 2022); teachers need scaffolded, contextually grounded support that helps them iteratively integrate tools, content, and pedagogy in real ESP courses. Without such scaffolded support, the coping strategies risk being piecemeal stopgaps rather than levers for meaningful TPACK development.

6. Conclusion and Limitation

This study demonstrates that while Indonesian ESP teachers exhibit strong confidence in content-related and pedagogical domains (CK, PK, and PCK), their competence declines markedly in technology-related dimensions (TK, TCK, and TPK), with full TPACK integration emerging as the most challenging area. These findings suggest that ESP teachers generally know what to teach and how to teach it, but continue to struggle with integrating technology in ways that are pedagogically coherent and professionally authentic. The mixed-method results further reveal that challenges such as slow technological adaptation, limited feedback delivery through digital means, weak linkage between ESP content and real-world practice, insufficient differentiation using technology, low multimedia design competence, and fragmented TPACK integration are often addressed through individual, short-term coping strategies rather than systematic institutional support. Although these strategies reflect teachers' resilience and adaptability, they also point to the absence of structured, context-sensitive professional development that meaningfully integrates technology, pedagogy, and ESP content. Accordingly, the study highlights the urgent need for sustained and scaffolded TPACK-oriented teacher education models that move beyond isolated tool training toward the development of pedagogical reasoning, instructional design capacity, and contextualized digital practices aligned with authentic professional domains. Such implications are particularly critical for ESP contexts, where technological integration must directly support discipline-specific communication goals and workplace relevance.

Despite its contributions, this study has several limitations that should be acknowledged. First, although demographic data such as gender, education level, teaching experience, and teaching location were collected, the analysis did not examine how these variables may have influenced ESP teachers' TPACK competence across domains, potentially limiting the depth of contextual interpretation. Second, the quantitative phase relied on self-reported perceptions of TPACK, which may be subject to response bias and may not fully reflect actual classroom practices or instructional quality. Third, while the qualitative interviews provided valuable insights into teachers' challenges and coping strategies, the interview sample was necessarily limited in size and scope and thus may not capture the full diversity of ESP teaching contexts across Indonesia. Additionally, the study focused on teachers' perspectives without incorporating classroom observations or student learning outcomes, which could have strengthened the triangulation of findings. Future research may address these limitations by employing longitudinal designs, incorporating observational and performance-based measures of TPACK, and examining demographic and institutional factors more systematically to provide a richer and more comprehensive understanding of TPACK development in ESP settings.

Acknowledgments

The authors would like to express their sincere gratitude to the fifty Indonesian English for Specific Purposes (ESP) university teachers who generously participated in this study. Their time, openness, and ethical cooperation in sharing their experiences and perspectives were invaluable to the completion of this research.

Authors' contributions

This study was initiated collaboratively by all authors. Neneng Islamiah was responsible for the study design, data collection, and data summarization, which were reviewed and revised by Prof. Bambang Yudi Cahyono. Muhamad Hasbi drafted the manuscript under the supervision and guidance of Dr. Suharyadi and Prof. Evi Eliyanah. Nurohman revised the Introduction, Literature Review, and Method sections, while Rahmad Hidayat refined the Results, Discussion, and Conclusion sections. All authors contributed substantially to the study and have read and approved the final manuscript.

Funding

The authors sincerely thank the Endowment Fund for Education (LPDP) under the Ministry of Finance of Indonesia and the Indonesian Education Scholarship (BPI) administered by the Ministry of Higher Education, Science, and Technology of the Republic of Indonesia for their valuable support and funding of this research.

Competing interests

The authors affirm that no potential conflicts of financial and personal interest exist with respect to the research, authorship, or publication of this article

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Sciedu Press.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

References

Aniq, L. N., & Drajati, N. A. (2019). Investigating EFL teachers' perceptions on their TPACK development. *Leksika, 13*(2), 95-101. https://doi.org/10.30595/lks.v13i2.5649.

Anjarani, S. (2020). Unpacking the TPACK framework in EFL context: A Review of empirical studies from 2015 to 2019. *IdeBahasa, 2*(2), 81-90. https://doi.org/10.37296/idebahasa.v2i2.42

Ashurovich, A. G. (2025). Enhancing linguo-cognitive competence of psychology students through TPACK-based ESP instructional framework. *Modern American Journal of Linguistics, Education, and Pedagogy, 1*(2), 639-644. Retrieved from https://usajournals.org/index.php/6/article/view/335

Brianza, E., Schmid, M., Tondeur, J., & Petko, D. (2022). Situating TPACK: A Systematic Literature Review of Context as a Domain of Knowledge. *Contemporary Issues in Technology and Teacher Education*, *22*(4), 707-753. https://eric.ed.gov/?id=EJ1370494

Budianto, L., Arifani, Y., Wardhono, A., & Poedjiastutie, D. (2023). The TPACK level of in-service EFL teacher online professional training: The perspectives of teachers, students, and trainers. *Journal of Digital Learning in Teacher Education*, *39*(2), 87-101. https://doi.org/10.1080/21532974.2023.2167024

Cahyono, B. Y., Istiqomah, F., Fitriyah, I., & Gozali, I. (2023). EFL teachers' voice on their preferred strategies in teaching EFL writing during the pandemic: Investigating the role of technology. *Turkish Online Journal of Distance Education*, *24*(3), 330-350. https://doi.org/10.17718/tojde.1175925

Çalik, E. Ö., & Mirici, İ. H. (2024). A systematic review of TPACK research on English language teaching. *Conhecimento & Diversidade, 16(*42), 435-462. https://doi.org/10.18316/rcd.v16i42.11716

Coancă, M. (2013). New approaches in teaching ESP. In *Conference proceedings of eLearning and Software for Education (eLSE), 9*(2), pp. 464-469. Carol I National Defence University Publishing House. https://doi.org/10.12753/2066-026X-13-182

Cresswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research (4th ed.)*. Boston, MA: Pearson.

Dudley-Evans, T. (1998). An overview of ESP in the 1990s. *The Japan Conference on English for Specific Purposes Proceedings*, 5-11. https://files.eric.ed.gov/fulltext/ED424775.pdf

Ginting, D., Fahmi, F., Barella, Y., Hasbi, M., Kadnawi, K., Rojabi, A. R., & Zumrudiana, A. (2022). Students' perception on TPACK practices on online language classes in the midst of pandemic. *International Journal of Evaluation and Research in Education*, *11*(4), 1995-2009. https://doi.org/10.11591/ijere.v11i4.23014

Gozali, I., & Cahyono, B. Y. (2022). Students' perspective on the importance of EFL teachers' TPACK (Technological Pedagogical Content Knowledge) and XK (Contextual Knowledge) for learning English during the Pandemic. In *Pasaa* (Vol. 64, pp. 244-277). https://doi.org/10.58837/chula.pasaa.64.1.11

Gvelesiani, I. (2023). Teaching ESP - New Strategies and Approaches. *Journal of Research in Higher Education*, *7*(1), 25-39. https://doi.org/10.24193/jrhe.2023.1.2

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., Black, W. C., & Anderson, R. E. (2018). *Multivariate Data Analysis*. https://doi.org/10.1002/9781119409137.ch4

Hasbi, M. (2024). Technology-enhanced EFL activities for Gen Z students' vocabulary building. In *How to Teach English to Gen Z Students* (Vol. 1, Issue 1, pp. 1-12). Rizquna.

Hasbi, M., Islamiah, N., Sulistyo, T., Sari, A. L., Nor, H., Marisa, R., Februati, M. N., Utomo, H. Y., Rahmah, M., Luh, N., Ning, P., Astawa, P., Devi, A. P., Dewi, R. F., Lisan, K. H., Amna, S., Ikhwan, A., Rohqim, F., Mangendre, Y., … Hartati, E. (2025). *Deep learning: A handbook for English language*. Rizquna.

Helingo, A., & Nurpahmi, S. (2024). Mapping the evolution: A bibliometric dive into TPACK research trends (2020-2023). *Journal of English Teaching and Linguistic Issues (JETLI)*, *3*(2), 84-95. https://doi.org/10.58194/jetli.v3i2.1837

Herring, M. C., Koehler, M. J., Mishra, P., Rosenberg, J. M., & Teske, J. (2006). Introduction to the second edition of the TPACK handbook. *In Handbook of technological pedagogical content knowledge (TPACK) for educators*. 1-18.

Ilahude, F. F., Inawati, I., & Pratolo, B. W. (2023). Teachers' TPACK development in English language teaching: A systematic review. *Premise: Journal of English Education*, *12*(3), 911. https://doi.org/10.24127/pj.v12i3.7429

Kamal, N., Amin, H., Jahangir, J., & Lodhi, M. A. (2025). Exploring English language teachers' TPACK competence: A systematic review of the past researches. *International Journal of Social Sciences Bulletin*, *3*(4), 754-762. https://doi.org/10.5281/zenodo.15301259

Khanahmadi, A. (2025). Teachers ' perspectives of and experience with TPACK in ESP classrooms. *TechTrends*, 69, 943-956. https://doi.org/10.1007/s11528-025-01087-9

Kristiawan, D., Carter, C., & Picard, M. (2022). Impact of CALL professional development for EFL materials on teacher agency and Technological Pedagogical Content Knowledge (TPACK) in Indonesian Islamic schools. *Teaching English with Technology*, *22*(3-4), 20-42. Retrieved from https://files.eric.ed.gov/fulltext/EJ1367619.pdf

Langhoff-Roos, J. (2016). State-of-the-art review. *Acta Obstetricia et Gynecologica Scandinavica*, *95*(9), 963-964. https://doi.org/10.1111/aogs.12945

Lee, H. Y., Chung, C. Y., & Wei, G. (2022). Research on technological pedagogical and content knowledge: A bibliometric analysis from 2011 to 2020. *Frontiers in Education*, *7*(February), 1-14. https://doi.org/10.3389/feduc.2022.765233

Lehiste, P. (2015). The impact of a professional development program on in-service teachers' TPACK: A study from Estonia. *Problems of Education in the 21st Century*, *66*(1), 18-28. https://doi.org/10.33225/pec/15.66.18

Lim, P. S., Din, W. A., Nik Mohamed, N. Z., & Swanto, S. (2021). Current trends in TPACK research in English language education: A systematic review of literature from 2017 to 2021. *International Journal of Education, Psychology and Counseling*, *6*(43), 219-234. https://doi.org/10.35631/ijepc.643018

Mackinnon, G. R. (2017). Highlighting the importance of context in the TPACK model: Three cases of non-traditional settings. *Issues and Trends in Educational Technology*, *5*(1), 4-16. https://doi.org/10.2458/azu_itet_v5i1_mackinnon

Mahdum. (2015). Technological pedagogical and content knowledge (TPACK) of English teachers in Pekanbaru, Riau, Indonesia. *Mediterranean Journal of Social Sciences*, *6*(5S1), 168-176. https://doi.org/10.5901/mjss.2015.v6n5s1p168

Mahendra, A. W. (2020). Constructing identity: Experiences of Indonesian ESP teachers in a language institute. *English Language Teaching Educational Journal*, *3*(3), 229-240. Retrieved from https://callej.org/index.php/journal/article/view/304

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record: The Voice of Scholarship in Education*, *108*(6), 1017-1054. https://doi.org/10.1177/016146810610800610

Mohamed, O. I., & Alani, N. N. (2022). E English for Specific Purposes: An overview: definitions, characteristics and development. *English Language Teaching*, *15*(12), 28. https://doi.org/10.5539/elt.v15n12p28

Mulyadi, D., Arifani, Y., Wijayantingsih, T. D., & Budiastuti, R. E. (2020). Blended learning in English for specific purposes (ESP) instruction: Lecturers' perspectives. *Call-Ej*, *21*(2), 204-219. Retrieved from https://callej.org/index.php/journal/article/view/304

Mulyadi, D., Wijayatingsih, T. D., Budiastuti, R. E., Ifadah, M., & Aimah, S. (2020). Technological pedagogical and content knowledge of ESP teachers in blended learning format. *International Journal of Emerging Technologies in Learning*, *15*(6), 126-139. https://doi.org/10.3991/ijet.v15i06.11490

Muslimin, A. I., Basthomi, Y., & Syahid, A. (2024). Bibliometric analysis of technological pedagogical content knowledge framework in English language teaching (TPACK-ELT). *Mextesol Journal*, *48*(4), 0-3. https://doi.org/10.61871/mj.v48n4-14

Muslimin, A. I., Mukminatien, N., & Ivone, F. M. (2023). TPACK-SAMR based lecturers' digital literacy competence and its implementation in EFL classroom. *Call-Ej*, *24*(3), 154-173. Retrieved from https://callej.org/index.php/journal/article/view/48

Nabung, E. A., & Guna, S. (2024). Teaching various perspectives on education and language learning in post-method era. *POST-METHOD ERA: Various Perspectives on Education and Language Learning*. Unika Santu Paulus Ruteng.

Poedjiastutie, D., & Oliver, R. (2017). English learning needs of ESP learners: Exploring stakeholder's perceptions at an Indonesian university. *TEFLIN Journal - A Publication on the Teaching and Learning of English*, *28*(1), 1. https://doi.org/10.15639/teflinjournal.v28i1/1-21

Quach, T. T. N., Le, V. C., Pham, T. X. T., Pham, P. P., & Nguyen, T. T. X. (2024). Integrating TPACK to enhance quality assurance in general English teaching: A case study in higher education. *Proceedings of the AsiaCALL International Conference*, *6*, 250-267. https://doi.org/10.54855/paic.24618

Rahimi, M., & Pourshahbaz, S. (Eds.). (2018). *English as a Foreign Language Teachers' TPACK: Emerging Research and Opportunities.* IGI Global Scientific Publishing. https://doi.org/10.4018/978-1-5225-6267-2

Rahman, M. (2015). English for Specific Purposes (ESP): A holistic review. *Universal Journal of Educational Research*, *3*(1), 24-31. https://doi.org/10.13189/ujer.2015.030104

Sari, H., Kamaruddin, R., Anshari, A., Nurhayati, A. & Samsinar, S. (2025). Teachers' views on the use of ICT in language courses. *Jurnal Onoma: Pendidikan, Bahasa, Dan Sastra*, *11*(2), 2492-2504. https://doi.org/10.30605/onoma.v11i2.5632

Sutimin, L. A., Sariyatun, S., Musadad, A. A., Yuniyanto, T., & Abidin, N. F. (2025). TPACK research trends in Indonesia: Contributions to enhancing the equivalency education history teacher community. *Journal of Nonformal Education*, *11*(1), 19-33. https://doi.org/10.15294/jone.v11i1.20625

Syamdianita, & Cahyono, B. Y. (2021). The EFL pre-service teachers' experiences and challenges in designing teaching materials using TPACK framework. *Studies in English Language and Education*, *8*(2), 561-577. https://doi.org/10.24815/siele.v8i2.19202

Tarnopolsky, O. B., & Kozhushko, S. P. (2020). Principled pragmatism and experiential learning: Two facets of constructivism in ESP. *Journal of Teaching English for Specific and Academic Purposes*, *8*(2), 123-133. https://doi.org/10.22190/JTESAP2002123T

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, *2*, 53-55. https://doi.org/10.5116/ijme.4dfb.8dfd

Topuzov, O., Malykhin, O., & Aristova, N. (2020). The right mix of approaches in the English language teaching: achieving desired learning outcomes in the ESP classroom. *SOCIETY. INTEGRATION. EDUCATION. Proceedings of the International Scientific Conference*, *5*, 558. https://doi.org/10.17770/sie2020vol5.4818

Umar, U.-, & Basuki, S. (2023). ESP: The development and the challenges. *JELL (Journal of English Language and Literature) STIBA-IEC Jakarta*, *8*(02), 187-196. https://doi.org/10.37110/jell.v8i02.178

Zaim, M., Serly, V., Al Hafizh, M., Rosita, N., Wahyuni, D., Marlina, L., & Zakiyah, M. (2025). Investigating students' needs for TPACK elements in listening materials for an English for economics and business e-book. *Studies in English Language and Education*, *12*(1), 83-102. https://doi.org/10.24815/siele.v12i1.38423

Zeng, Y., Wang, Y., & Li, S. (2022). The relationship between teachers' information technology integration self-efficacy and TPACK: A meta-analysis. *Frontiers in psychology*, *13*, 1091017. https://doi.org/10.3389/fpsyg.2022.1091017