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Skill-Differentiated TPACK Enactment and Its Challenges among English Teachers: A Case Study

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Abstract

Although schools are increasingly equipped with digital facilities, adequate infrastructure does not necessarily ensure meaningful technology integration in English language classrooms, particularly across different language skills. This study examines how three English teachers at a technology-equipped private junior high school in Palu enacted Technological Pedagogical and Content Knowledge (TPACK) and identifies the challenges constraining its implementation. A qualitative case study design was employed, with data collected through nine classroom observations and semi-structured interviews. The data were analyzed through data condensation, data display, and conclusion drawing, using the TPACK framework and Ertmer's two-order barrier model as deductive coding categories. The findings reveal that TPACK enactment varied across language skills. Teachers selected technology purposefully in writing and reading lessons but relied predominantly on convenience-based choices in speaking lessons, where technology integration was weakest. Technology generally served as pedagogical support rather than as a structurally essential component of instruction, with only one of the nine observed lessons demonstrating fully integrated TPACK. First-order barriers were largely absent

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because the school provided sufficient infrastructure, whereas second-order barriers arose from teachers' limited technological repertoire and difficulties in designing technology-based assessments rather than from negative attitudes toward technology. An additional constraint not fully captured by Ertmer's framework involved students' inconsistent access to devices and limited familiarity with digital applications. The study concludes that infrastructural adequacy alone does not guarantee integrated TPACK enactment. These findings extend understanding of skill-specific technology integration in English language teaching and imply that teacher professional development should prioritize the expansion of technological repertoires and technology-based assessment capabilities. They also suggest that existing barrier models should incorporate classroom-level constraints related to students' access and digital competence.

Keywords: English Language Teaching; Second-Order Barriers; Teacher Professional Development; Technology Integration; TPACK Enactment

INTRODUCTION

Technology integration has become central to English Language Teaching (ELT), where digital tools open opportunities for authentic communication, exposure to real-world language use, and access to global resources. The presence of technology, however, does not guarantee effective learning. Research on English teachers' TPACK emphasises that effective integration rests on teachers' understanding of how a given tool serves a specific language learning goal rather than on the tool itself (Bostancıoğlu & Handley, 2018), and recent syntheses of English teacher education reach the same conclusion, reporting that limited technical skill, uneven resourcing, and inadequate training continue to constrain integration even as digital tools proliferate (Ye et al., 2024). Two decades of research have therefore shifted attention away from access and toward the quality of integration.

This shift is visible in Indonesia. The Ministry of Education and Culture has actively promoted digital-based learning through the Merdeka Belajar programme, emphasising teacher readiness in utilising educational technology (Kemendikbud, 2020). Yet empirical evidence suggests that many Indonesian teachers still use technology at a surface level, chiefly for presenting material rather than for transforming how learners engage with it (Rodliyah, 2018), and that positive attitudes toward technology often coexist with unevenly developed integration knowledge (Drajati et al., 2018; Prasojo et al., 2020). A systematic review of

TPACK in English as a second and foreign language settings reaches a similar conclusion, noting that integration in this subject area is shaped heavily by context rather than by tool availability alone (Greene & Jones, 2020), and Indonesian studies continue to report a gap between teachers' recognition of the framework and their capacity to apply it (Liando et al., 2023).

To conceptualise this integration, (Mishra & Koehler, 2006) introduced the Technological Pedagogical and Content Knowledge (TPACK) framework, extending the established concept of Pedagogical Content Knowledge by adding a technological dimension. The framework comprises seven domains, of which (Koehler & Mishra, 2009) identify the technology-related intersections — Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and the fully integrated TPACK — as the most consequential, because they constitute genuinely new knowledge that cannot be reduced to any single component. The present study concentrates analytically on these three intersections, consistent with Graham's (2011) argument that meaningful integration becomes observable precisely when technology reshapes how content is represented, how pedagogy is enacted, or both simultaneously.

A parallel body of work explains why integration falls short. Ertmer (2005) distinguishes first-order barriers, which are external to the teacher (access, training, institutional support), from second-order barriers, which are internal (pedagogical beliefs, technology beliefs and skills, and willingness to change). Subsequent research has largely confirmed the primacy of second-order barriers: teacher beliefs function as gatekeepers of integration even where resources are ample (Ertmer et al., 2012), and (Tsai & Chai, 2012) propose design capability as a further constraint operating beyond both orders. At the same time, evidence from lower-resource systems shows that first-order barriers are far from obsolete globally: teachers in developing contexts continue to report inadequate equipment, unreliable connectivity, and absent training as their dominant constraints (Nii Akai Nettey et al., 2024). The barrier profile of any given school is therefore an empirical question rather than an assumption. Reviews of the field have likewise stressed that context is not background to TPACK but a domain of knowledge in its own right, operating at levels ranging from the immediate classroom to the wider system (Brianza et al., 2022), which is precisely why single-institution evidence remains valuable.

Existing TPACK research on English teachers offers useful comparison points but leaves a specific gap. Afiatun (2016) and (Aniq et al., 2022) each studied three teachers drawn from three different schools, producing cross-school comparisons in which institutional conditions varied alongside teacher practice. (Nurdin et al., 2023) examined two teachers in a public junior high school, where infrastructural conditions differ from those of a well-resourced private institution. Haryati et al. (2023) observed three exemplary teachers across three high schools but confined the analysis to reading instruction, leaving open whether the same quality of enactment holds across other language skills. (Zhang et al., 2020) explored university teachers' TPACK in a flipped classroom but relied on reported experiences and perceptions rather than direct observation, reintroducing the self-report limitation that the TPACK literature has repeatedly flagged as a knowledge-practice divide (Willermark, 2018). None of these studies examined all English teachers within a single bounded institution in which infrastructure and administrative policy are held constant. This matters because reviews of the field report that TPACK research remains dominated by self-report designs and by aggregate measures that obscure within-subject variation (Irwanto, 2021).

The present study addresses that gap by treating a single technology-equipped private junior high school as a bounded case and by applying the TPACK framework and Ertmer's barrier model jointly rather than separately. Its novelty is threefold. First, it holds institutional conditions constant so that variation in enactment can be attributed to teacher practice rather than to unequal resources. Second, it studies a setting in which first-order barriers have largely been removed by institutional investment, allowing second-order and other constraints to be examined directly. Third, it treats enactment as observable rather than self-reported, following Willermark's (2018) distinction between possessing TPACK and enacting it, and therefore anchors interview questions in lessons that had already been observed.

Accordingly, this study is concerned not with whether teachers possess strong content, pedagogical, or technological knowledge as separate competencies, but with how the presence of technology changes, enables, or constrains the representation of English language content and the enactment of English language pedagogy in practice. Two research questions guide the study: (1) How do English teachers at the junior high school of Golden Gate School Palu enact TPACK in their classrooms? (2) What challenges do these teachers face in enacting TPACK? The corresponding objectives are to analyse observed patterns of

TPACK enactment across language skills and to identify and classify the challenges that constrain it.

METHODS

Research Design

This study employed a qualitative case study design. A case study is appropriate when researchers seek in-depth understanding of a contemporary phenomenon within its real-life context, particularly where the boundaries between phenomenon and context are not clearly evident (Yin, 2018). The design suits the present aims because both research questions are "how" and "what" questions concerning practice as it occurs in situ. The case was bounded institutionally: all English teachers at one junior high school, observed within their own classrooms, constituted the single case under study.

Setting and Timeframe

The study was conducted at the junior high school unit of Golden Gate School, a private school in Palu, Central Sulawesi, Indonesia. The school was selected because it has invested in modern learning facilities, including Smart TVs, projectors, speakers, stable internet access, and a learning management system, and because preliminary informal observation suggested marked variation in how teachers used these resources. Class sizes at the junior high school level are unusually small, ranging from three to six students. Data collection was carried out over a period of December 2025 spanning approximately 3 weeks from the first classroom observation to the final interview.

Participants and Sampling

The study employed total population sampling, in which all members of a defined population who meet the inclusion criteria are included (Etikan & Bala, 2017). This strategy is appropriate when the population is small and accessible and when all members can contribute to the research questions. The inclusion criteria were: current employment as an English teacher at the junior high school unit; English as the primary teaching responsibility; regular access to school technology facilities; and voluntary willingness to be observed and interviewed. All three eligible teachers agreed to participate, yielding a 100% participation rate. Three participants are consistent with intensive qualitative designs (Creswell & Poth, 2018) and with comparable TPACK studies in the Indonesian EFL context (Afiatun, 2016;

Aniq et al., 2022). All participants gave informed written consent, and the school granted formal written permission; teachers were assured of confidentiality, voluntary participation, and the right to withdraw.

Instruments and Data Collection

Two complementary instruments were used. The classroom observation guide was adapted from the TPACK-based observation instrument validated by Hofer et al. (2011). For each lesson, the observer recorded the learning objective, the digital technologies used, and the learning activities in chronological order; these notes then served as the evidence base for rating three domains after the lesson rather than during it. Because generic TPACK measures are known to fit language teaching poorly, indicators were framed in language-specific terms, following arguments for subject-situated instrumentation in EFL (Baser et al., 2016). Each domain was operationalised through observable indicators: TCK was recorded when technology changed how English content was represented or accessed beyond what non-digital tools allow; TPK when the teacher's pedagogical strategy shifted in response to the affordances or constraints of the tool; and integrated TPACK when technology was not merely supportive but structurally essential, such that the activity could not retain its intended form or purpose without it. Where teachers did not state objectives explicitly, objectives were inferred from activities and language content, and contextual factors were recorded in field notes and weighed during interpretation.

Three observations were conducted per teacher, producing nine observed lessons in total, in order to capture varied instructional contexts and technology applications. Observation was chosen as the primary method because actual integration practices frequently diverge from stated intentions (Graham, 2011) and because self-report instruments cannot support conclusions about enacted TPACK, which remains rarely assessed in authentic classroom conditions (Aumann et al., 2023).

A semi-structured interview guide formed the second instrument. The semi-structured format was chosen so that a predetermined framework could guide questioning while leaving room for responses beyond the theoretical categories, since teachers' reasoning does not always map neatly onto predefined domains. Questions were derived directly from the two guiding frameworks (Mishra & Koehler, 2006; Koehler & Mishra, 2009; Ertmer, 2005) and organised into five sections corresponding to TCK, TPK, TPACK, first-order barriers, and second-order barriers. Each interview was conducted individually after all

observations for that teacher were complete, so that teachers could be asked to explain the rationale behind specific technology decisions already documented in field notes rather than describing their practice in the abstract. This sequencing directly addresses the knowledge-practice divide (Willermark, 2018). Interviews were audio-recorded with consent and transcribed verbatim.

Data Analysis

Data were analysed using the interactive framework of Miles et al. (2020), comprising data condensation, data display, and conclusion drawing and verification. Condensation began during collection: after each session the researcher prepared a summary sheet of main findings, preliminary codes, and emerging questions. Coding was primarily deductive. Data addressing the first research question were coded into the three focal TPACK domains (TCK, TPK, TPACK); data addressing the second were coded into Ertmer's (2005) first- and second-order barriers. Segments that were relevant but did not fit these categories received additional descriptive codes so that unanticipated findings would be preserved rather than discarded.

Two display formats were then constructed: a TPACK Enactment Matrix organising observational and interview evidence per teacher and across teachers, and a Challenges Classification Matrix organising barriers by order and by evidence source. Conclusion drawing proceeded through pattern identification, cross-case comparison, grouping of similar challenges, and consideration of alternative explanations. Findings were verified by triangulating observation and interview evidence within each domain and barrier category, and by member checking, in which preliminary interpretations were returned to participating teachers for confirmation (Creswell & Poth, 2018).

RESULTS

Participant Profile

The three participants shared the same qualification but differed in experience, which allows experience-related variation to be examined while holding academic background constant (Table 1).

Table 1. Participant profile

Participant code	Teaching experience	Educational background	Age range
T1	5 years	Bachelor's in English Education	25–30
T2	12 years	Bachelor's in English Education	35–40
T3	3 years	Bachelor's in English Education	25–30

Note. All three teachers had taught at the school for three years at the time of data collection. Class sizes ranged from six students (T1, T2) to three students (T3).

TPACK Enactment Across the Nine Observed Lessons

Table 2 summarises the nine observed lessons. TCK was evident in every lesson, TPK in six, and fully integrated TPACK in one. The distribution shows that the teachers were consistent users of technology but that the depth of integration varied systematically with the language skill in focus.

Table 2. Technology use and TPACK domain evidence in the nine observed lessons

Lesson	Skill focus	Main technology used	TCK	TPK	TPACK	Depth of integration
T1-O1	Writing (descriptive text)	Canva	✓	✓	✓	Structurally essential
T1-O2	Reading / listening (recount)[a]	Authentic video (YouTube)	✓	✓	–	Pedagogical support
T1-O3	Speaking	Video / PowerPoint (pre-task input only)	✓	○	–	Pre-task support only
T2-O1	Reading / listening (folktale)[a]	Authentic video, PowerPoint	✓	✓	–	Pedagogical support
T2-O2	Reading / listening (procedure)[a]	Authentic video, PowerPoint	✓	✓	–	Pedagogical support
T2-O3	Speaking	Video / PowerPoint (pre-task input only)	✓	○	–	Pre-task support only
T3-O1	Writing (advertisement / brochure)	Canva, Quizizz	✓	✓	–	Pedagogical support
T3-O2	Reading / listening[a]	[confirm from field notes]	✓	✓	–	Pedagogical support
T3-O3	Speaking	Video / PowerPoint (pre-task input only)	✓	○	–	Pre-task support only

Note. ✓ = domain clearly evident; ○ = partially evident; – = not evident. O1–O3 denote the first to third observation of each teacher. [a] Skill focus inferred from the text type and the authentic video genre recorded in the field notes.

Three patterns emerged. First, technology selection in writing and reading lessons was governed by deliberate reasoning about tool affordances in relation to specific language objectives. T1 paired Canva with a descriptive writing task for its drag-and-drop layout affordance and explicitly rejected a word processor because it "would not create the same learning experience" for descriptive text structure. T3 selected Canva for advertisement and brochure design in alignment with the visual-structural demands of that genre, explaining a preference for technology that "helps students understand the language content more easily rather than simply making the lesson more interesting." In reading and listening lessons, T1 and T2 selected authentic video to convey intonation and discourse structure unavailable in print.

Second, this purposefulness did not extend to speaking. In all three speaking lessons, technology appeared only at the opening stage to supply models or input and was absent during the core speaking activity. Tool selection also shifted from affordance-based to availability-based reasoning: T1 and T2 chose YouTube for speaking input because it was "the easiest resource to access." T1 additionally reported difficulty finding technology that "genuinely fits" a speaking task. T2 and T3 framed the absence differently, as a pedagogical judgement: T2 stated that speaking practice "usually happens without much technology because I believe students need direct interaction," and T3 that oral practice "depends more on classroom interaction than on technology itself."

Third, technology functioned as pedagogical support rather than as a structurally essential component in eight of the nine lessons. Only T1-O1 met the criterion of structural essentiality: the Canva task required platform interaction and could not have been replicated in equivalent form without it. In the remaining eight lessons technology improved lesson quality, but the activities could still have been carried out without it. T2 articulated this position directly, observing that "if a lesson can achieve the same result without technology, then the technology may not be necessary." Figure 1 displays the distribution of integration depth by teacher and the presence of technology during the core language task by skill focus.

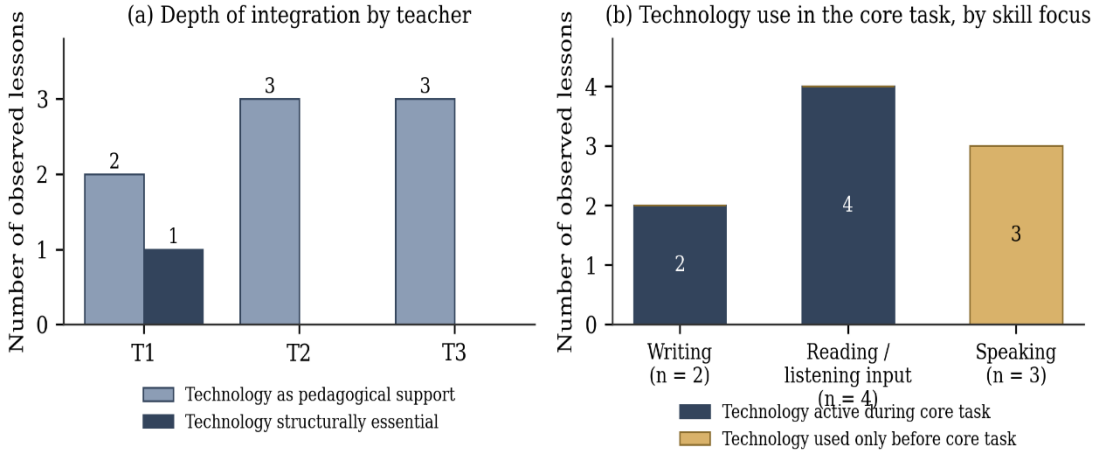


Figure 1. Depth of technology integration by teacher (a) and technology use during the core language task by skill focus (b), across nine observed lessons

Challenges in Enacting TPACK

Table 3 classifies the challenges identified across the nine lessons and three interviews. The barrier profile of this school was distinctive: first-order barriers in Ertmer's (2005) sense were effectively absent, while the constraints that did operate were of two kinds — second-order challenges concerning teacher capability, and a classroom-level constraint originating with students rather than teachers.

Table 3. Classification of challenges in TPACK enactment

Category	Definition	Observation evidence	Interview evidence
Adequate first-order conditions	School-provided infrastructure (Smart TV, projector, internet, LMS) was consistently available and functional; no first-order barriers were identified in any of the nine observations.	No technical failures recorded across all nine observations. Small class sizes (six students for T1 and T2; three for T3) supported individual monitoring during device use.	T1: "There are no barriers. Smart TVs, projectors, Wi-Fi, and speakers are already provided." T2 confirmed good facilities. T1 and T3 both cited small class size as facilitating real-time monitoring.
Student device access and application familiarity (classroom-level)	Students' access to personal devices and limited familiarity with certain applications recurred as a practical constraint. It fits neither order of Ertmer's teacher-level framework.	T1-O1: two students required additional Canva guidance, slowing the opening phase. T3-O1: device access delays (Canva, Quizizz on personal devices) reduced time for the main task.	T1: "The most evident challenge is students' limited familiarity with certain technologies, such as Canva." T2: students "sometimes forget to bring their own devices, so they have to share or use their mobile phones."

Category	Definition	Observation evidence	Interview evidence
Second-order challenges as precision gaps	Internal constraints were not resistance or negative belief but limited repertoire width and a shared gap in technology-based assessment design.	No teacher avoided or refused technology in any observation. T2 relied on video and PowerPoint across all three lessons without tool variation despite differing content objectives, indicating a repertoire constraint rather than deliberate diversification.	T1 and T3 independently identified "designing technology-based assessments that accurately measure students' learning" as a challenge. T2 described familiar tools as effective without objective-specific rationale. All three expressed a desire for professional development.

Note. Interview extracts are translated where necessary and reported verbatim from transcripts.

Negative and Anomalous Cases

Three findings ran counter to the dominant pattern and are reported here rather than smoothed over. The first is T1-O1, the single lesson in which technology became structurally essential; as a lone positive outlier it is the most informative case in the dataset, since it demonstrates that fully integrated TPACK was attainable within the existing infrastructure and repertoire of this school. The second is the inverse relationship between experience and variety: T2, the most experienced teacher with twelve years of service, showed the most consistent but least varied technology use, whereas the two less experienced teachers displayed wider tool choice and produced the only structurally essential lesson. Experience appears to have reinforced established tool habits rather than expanded them. The third is that the weakest integration occurred in speaking, the skill for which the literature reviewed above anticipates the richest interactive possibilities, and it occurred in a setting where neither equipment nor connectivity constrained what teachers could attempt.

DISCUSSION

Skill-Differentiated Enactment

The central analytical result is that TPACK enactment in this case was skill-differentiated rather than uniform. The same three teachers who reasoned carefully about tool affordances for writing and reading defaulted to availability-based selection for speaking. This finding qualifies studies reporting effective TPACK implementation in single-skill contexts. Haryati et al. (2023), for instance, found the framework well realised in reading instruction among exemplary Indonesian teachers; the present case suggests that such a result

may not generalise across skills within the same teacher, since the issue here was not an absence of pedagogical knowledge about technology but its uneven distribution across language skills. A teacher may hold robust TPK for reading, where digital text and video reshape access to content, while holding weaker TPK for speaking, where supporting oral production requires a different class of tool altogether. The tools most readily available to these teachers also reflect this asymmetry: applications that restructure written composition (Lin et al., 2018) are far more familiar in the literature and in practice than tools designed to scaffold spoken production. Because content knowledge in ELT is skills-based and communicative rather than propositional, no single technological solution serves all its dimensions (Greene & Jones, 2020), and the general TPACK framework does not by itself predict where within a subject integration will be strong or weak.

The speaking finding admits two readings, and the data support both simultaneously for different teachers. For T1, who reported difficulty locating tools that genuinely fit a speaking task, the pattern indicates a repertoire gap rather than a principled position — and one worth closing, since technology-mediated task-based instruction has been shown to improve learners' speech rate and accuracy over a comparable timeframe (Albarqi, 2024). For T2 and T3, who justified the absence of technology by appeal to the value of direct interaction, the pattern reflects a defensible pedagogical position rather than a gap, grounded in the long-standing communicative premise that oral proficiency develops chiefly through sustained learner-to-learner interaction. Distinguishing these two readings matters practically: the first calls for exposure to tools that support oral production, the second for a conversation about where technology can add value to interaction rather than displace it. Treating both as the same deficit would misdirect professional development.

Comparison with Previous Research

The finding that technology functioned as support rather than as a structurally essential component in eight of nine lessons provides observational evidence of the knowledge-practice divide described by Willermark (2018). The teachers used technology consistently and without resistance, yet rarely reached the level at which technology is constitutive of the activity — the standard Graham (2011) identifies as the observable marker of meaningful integration. This confirms Rodliyah's (2018) characterisation of Indonesian teachers' technology use as largely presentational rather than transformative, and extends it

in an important respect: the pattern persisted in a well-resourced private school where resource constraints had been removed, which locates the explanation outside infrastructure.

The barrier findings both support and refine Ertmer's (2005) model. Consistent with Ertmer et al. (2012), second-order factors dominated once first-order barriers were absent. However, the specific content of those second-order factors diverged from what the model anticipates. Ertmer describes beliefs, skills, and willingness to change; in this case beliefs and willingness were not the constraint, since no teacher avoided or disparaged technology in any observed lesson. Survey evidence from 251 Indonesian English teachers likewise indicates that the relationship between TPACK and pedagogical belief is not straightforwardly positive, and that strong beliefs may operate independently of technological capability (Almunawaroh & Steklacs, 2025). What constrained enactment was narrower: the width of the tool repertoire teachers had developed confidence to deploy, and a shared difficulty in designing technology-based assessment aligned to specific language objectives. The latter is not idiosyncratic to this school; digital assessment has been identified as the weakest area of English teachers' technological competence in several recent studies (Insani et al., 2024). These are precision gaps rather than resistance, and they are closer to the design-capability constraint that Tsai and Chai (2012) argue operates beyond the two established orders. The distinction carries practical weight, because beliefs are notoriously difficult to shift whereas repertoire and design skill respond to targeted training.

A further result sits outside the framework entirely. Students' inconsistent device access and limited application familiarity repeatedly shaped what teachers could do, yet neither order of Ertmer's model accommodates it: first-order barriers are external factors affecting teachers, and second-order barriers are teacher-internal. This constraint is neither. It is best understood as a classroom-level constraint, and it corresponds closely to what Brianza et al. (2022) term the immediate contextual level — the conditions inside the classroom that bear directly on what a teacher can enact. It was consequential — in T1-O1 two students needed additional guidance before the task could begin, and in T3-O1 device access delays reduced the time available for the main activity. The closest precedent in the literature is the observation that access and basic digital skill do not by themselves produce effective integration; the present study indicates that this holds for students as well as teachers, particularly where students are expected to supply their own devices.

Implications

Three implications follow. Theoretically, barrier models applied to classroom-based TPACK research would benefit from an explicit student-side category, since bring-your-own-device arrangements make student readiness a determinant of what teachers can enact. Analytically, TPACK studies in ELT should disaggregate by language skill; an aggregate rating for a teacher would have obscured the clearest pattern in this dataset, because the same teacher scored differently across skills. Practically, professional development at institutions resembling this one should target repertoire breadth for oral production and technology-based assessment design rather than attitudes toward technology, and should be designed specifically for English language teaching rather than delivered as general ICT training. Recent syntheses of TPACK development in English teacher education point the same way, recommending sustained, subject-situated professional learning over generic technology training (Ye et al., 2024). Structured reflective practice on teachers' own technology-integrated lessons offers one tested route, having been shown to strengthen in-service English teachers' TPACK in Indonesian schools (Sari et al., 2021). The existence of one structurally integrated lesson within this school suggests that the more efficient starting point is examining and replicating conditions already achieved internally, rather than importing external models.

Limitations

Four limitations bound these claims. First, the case comprises one school and three teachers, so the findings describe a bounded institutional context rather than a population; transferability rests on similarity of conditions, not statistical generalisation. Second, class sizes of three to six students are atypical for Indonesian junior high schools and materially eased the monitoring of technology-supported activity; the same integration patterns should not be assumed to hold in larger classes. Third, three observations per teacher, with each focusing on a different skill, means that the skill-differentiated pattern rests on a small number of lessons per skill and would benefit from repeated observation within the same skill. Fourth, the study documents enactment and its constraints but collects no student learning outcome data, so no claim is made about the effect of integration depth on achievement. The presence of an observer may also have influenced practice, although the consistency of patterns across three sessions per teacher reduces this concern.

CONCLUSION

This study examined how three English teachers in a technology-equipped private junior high school in Palu enacted TPACK and what constrained that enactment. Three patterns emerged. TPACK enactment was skill-differentiated, purposeful in writing and reading but availability-driven and shallowest in speaking, where technology appeared only before the core task. Adequate infrastructure was necessary but not sufficient: with first-order barriers effectively absent, only one of nine lessons reached structurally essential integration. The second-order challenges that remained concerned capability rather than conviction, taking the form of a narrow tool repertoire and difficulty designing technology-based assessment, alongside a classroom-level constraint arising from students' device access and application familiarity.

The study contributes to knowledge in three ways. It supplies observational rather than self-reported evidence of the knowledge-practice divide within a bounded institution where infrastructure and administrative policy were held constant. It specifies the content of second-order barriers in a setting where belief-level resistance was absent, distinguishing precision gaps from resistance and thereby identifying a more tractable target for intervention. And it documents a constraint that falls outside Ertmer's teacher-level orders, arguing for a classroom-level category that accounts for student-side readiness in bring-your-own-device contexts.

Three directions for further research follow. Comparative work across multiple schools in the same region, including public schools where first-order barriers may still operate, would establish whether skill-differentiated enactment is specific to well-resourced private institutions or characteristic of English language teaching in Central Sulawesi more broadly. Studies in conventionally sized classes would test whether the patterns reported here survive the loss of close individual monitoring. Finally, design-based research on technology-supported speaking production, and on technology-based assessment of language objectives, would address the two capability gaps this study identified as most consequential, and would test whether the conditions that produced the single structurally integrated lesson observed here can be deliberately reproduced.

REFERENCES

Afiatun, T. (2016). *Technological pedagogical and content knowledge (TPACK) in action: A portrayal of novice teacher practice with ICT integration into EFL class* [Master's thesis, Universitas Pendidikan Indonesia]. UPI Repository. https://repository.upi.edu/27939/

Albarqi, G. (2024). Investigating EFL oral production in a technology-mediated TBLT context. *Journal of China Computer-Assisted Language Learning, 4*(2), 271–299. https://doi.org/10.1515/jccall-2023-0030

Almunawaroh, N. F., & Steklács, J. (2025). Curriculum material use in EFL classrooms: Moderation and mediation effects of teachers' beliefs and TPACK. *Education Sciences, 15*(12), 1647. https://doi.org/10.3390/educsci15121647

Aniq, L. N., Drajati, N. A., & Fauziati, E. (2022). Covid-19 outbreak response: Tracing EFL teachers' beliefs & practices of TPACK in teaching writing. *Indonesian Journal of Applied Linguistics, 12*(1), 135–146. https://doi.org/10.17509/ijal.v12i1.46535

Aumann, A., Schnebel, S., & Weitzel, H. (2023). The EnTPACK rubric: Development, validation, and reliability of an instrument for measuring pre-service science teachers' enacted TPACK. *Frontiers in Education, 8*, 1190152. https://doi.org/10.3389/feduc.2023.1190152

Baser, D., Kopcha, T. J., & Ozden, M. Y. (2016). Developing a technological pedagogical content knowledge (TPACK) assessment for preservice teachers learning to teach English as a foreign language. *Computer Assisted Language Learning, 29*(4), 749–764. https://doi.org/10.1080/09588221.2015.1047456

Bostancıoğlu, A., & Handley, Z. (2018). Developing and validating a questionnaire for evaluating the EFL 'Total PACKage': Technological pedagogical content knowledge (TPACK) for English as a foreign language (EFL). *Computer Assisted Language Learning, 31*(5–6), 572–598. https://doi.org/10.1080/09588221.2017.1422524

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://citejournal.org/volume-22/issue-4-22/general/situating-tpack-a-systematic-literature-review-of-context-as-a-domain-of-knowledge

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). SAGE Publications.

Drajati, N. A., Tan, L., Haryati, S., Rochsantiningsih, D., & Zainnuri, H. (2018). Investigating English language teachers in developing TPACK and multimodal literacy. *Indonesian Journal of Applied Linguistics, 7*(3), 575–582. https://doi.org/10.17509/ijal.v7i3.9806

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development, 53*(4), 25–39. https://doi.org/10.1007/BF02504683

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education, 59*(2), 423–435. https://doi.org/10.1016/j.compedu.2012.02.001

Etikan, I., & Bala, K. (2017). Sampling and sampling methods. *Biometrics & Biostatistics International Journal, 5*(6), 215–217. https://doi.org/10.15406/bbij.2017.05.00149

Graham, C. R. (2011). Theoretical considerations for understanding technological pedagogical content knowledge (TPACK). *Computers & Education, 57*(3), 1953–1960. https://doi.org/10.1016/j.compedu.2011.04.010

Greene, M. D., & Jones, W. M. (2020). Analyzing contextual levels and applications of technological pedagogical content knowledge (TPACK) in English as a second language subject area: A systematic literature review. *Educational Technology & Society, 23*(4), 75–88. https://www.jstor.org/stable/26981745

Haryati, S., Yuliasri, I., Nurkamto, J., & Fitriati, S. W. (2023). TPACK praxis in EFL reading classroom: A case of technology-infused teaching from Indonesia. *Pegem Journal of Education and Instruction, 14*(1), 205–217. https://www.pegegog.net/index.php/pegegog/article/view/2555

Hofer, M., Grandgenett, N., Harris, J., & Swan, K. (2011). Testing a TPACK-based technology integration observation instrument. In M. Koehler & P. Mishra (Eds.), *Proceedings of SITE 2011—Society for Information Technology & Teacher Education International Conference* (pp. 4352–4359). Association for the Advancement of Computing in Education. https://www.learntechlib.org/primary/p/37015/

Insani, A. N. P., Aprilia, P. K., & Mistar, J. (2024). Challenges and opportunities: A qualitative study of EFL teachers' digital proficiency and its impact on interactive language assessment. *Voices of English Language Education Society, 8*(1), 43–51. https://doi.org/10.29408/veles.v8i1.25095

Irwanto, I. (2021). Research trends in technological pedagogical content knowledge (TPACK): A systematic literature review from 2010 to 2021. *European Journal of Educational Research, 10*(4), 2045–2054. https://doi.org/10.12973/eu-jer.10.4.2045

Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education, 9*(1), 60–70. https://citejournal.org/volume-9/issue-1-09/general/what-is-technological-pedagogicalcontent-knowledge/

Liando, N. V. F., Tatipang, D. P., & Wuntu, C. N. (2023). TPACK framework towards 21st century's pre-service English teachers: Opportunities and challenges in application. *Edumaspul: Jurnal Pendidikan, 7*(1), 1799–1815. https://doi.org/10.33487/edumaspul.v7i1.6479

Lin, V., Liu, G.-Z., & Chen, N.-S. (2018). The effects of an augmented-reality ubiquitous writing application: A comparative pilot project for enhancing EFL writing instruction. *Computer Assisted Language Learning, 31*(3), 221–245. https://doi.org/10.1080/09588221.2017.1420483

Miles, M. B., Huberman, A. M., & Saldaña, J. (2020). *Qualitative data analysis: A methods sourcebook* (4th ed.). SAGE Publications.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017–1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Nettey, J. N. A., Mensah, R. O., Asafo-Adjei, R., & Babah, P. A. (2024). Analyzing the challenges basic school teachers face in integrating information and communication technology into teaching and learning activities in a developing country. *Cogent Education, 11*(1), 2364544. https://doi.org/10.1080/2331186X.2024.2364544

Nurdin, N., Anugrawati, N., & Mannong, A. B. M. (2023). Analyzing the implementation of technological pedagogical content knowledge (TPACK) by EFL teachers in the classroom. *Journal of Computer Interaction in Education, 6*(1), 49–60. https://doi.org/10.56983/jcie.v6i1.591

Prasojo, L. D., Habibi, A., Mukminin, A., & Yaakob, M. F. M. (2020). Domains of technological pedagogical and content knowledge: Factor analysis of Indonesian in-service EFL teachers. *International Journal of Instruction, 13*(4), 593–608. https://doi.org/10.29333/iji.2020.13437a

Rodliyah, R. S. (2018). Vocational school EFL teachers' practices of integrating ICT into English lessons: Teachers' voices. *Indonesian Journal of Applied Linguistics, 8*(2), 418–428. https://doi.org/10.17509/ijal.v8i2.13308

Sari, Y. R., Drajati, N. A., So, H.-J., & Sumardi, S. (2021). Enhancing EFL teachers' technological pedagogical content knowledge (TPACK) competence through reflective practice. *TEFLIN Journal, 32*(1), 117–133. https://doi.org/10.15639/teflinjournal.v32i1/117-133

Tsai, C.-C., & Chai, C. S. (2012). The "third"-order barrier for technology-integration instruction: Implications for teacher education. *Australasian Journal of Educational Technology, 28*(6), 1057–1060. https://doi.org/10.14742/ajet.810

Willermark, S. (2018). Technological pedagogical and content knowledge: A review of empirical studies published from 2011 to 2016. *Journal of Educational Computing Research, 56*(3), 315–343. https://doi.org/10.1177/0735633117713114

Ye, L., Ismail, H. H., & Aziz, A. A. (2024). Innovative strategies for TPACK development in pre-service English teacher education in the 21st century: A systematic review. *Forum for Linguistic Studies, 6*(6), 274–294. https://doi.org/10.30564/fls.v6i6.7308

Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). SAGE Publications.

Zhang, M., & Fang, X. (2022). Exploring university EFL teachers' technological pedagogical content knowledge and teacher efficacy in technology-integrated flipped classroom. *SAGE Open, 12*(3). https://doi.org/10.1177/21582440221116105