
TPACK COMPETENCE AMONG PRE-SERVICE ENGLISH TEACHERS IN THE ERA OF THE MERDEKA CURRICULUM: A MIXED-METHODS STUDY AT AN INDONESIAN LPTK**Roza Susanti¹, Dwi Settya Mahaputri², Ifna Nifriza³, Indah Rahmalia⁴, Afdaleni⁵**

¹English Study Program, STKIP Yayasan Abdi Pendidikan Payakumbuh
Email: rozasusanti.buja@gmail.com

²English Study Program, STKIP Yayasan Abdi Pendidikan Payakumbuh
Email: dwisettyamahaputri@gmail.com

³English Study Program, STKIP Yayasan Abdi Pendidikan Payakumbuh
Email: ifnanifriza87@gmail.com

⁴English Study Program, STKIP Yayasan Abdi Pendidikan Payakumbuh
Email: rahmaliabayu@gmail.com

⁵Universitas Mohammad Natsir Bukittinggi
Email: afdaleni_09@yahoo.com

ABSTRACT

The Merdeka Curriculum has intensified demands on Indonesian teacher education institutions (LPTK) to prepare pre-service English teachers capable of integrating technology meaningfully into learner-centered classrooms. However, no empirical study has yet examined TPACK development within a regional LPTK explicitly operating under Merdeka Curriculum mandates. This study investigated the TPACK competence levels of pre-service English teachers at STKIP Yayasan Abdi Pendidikan Payakumbuh and examined how the institution's preparation program addresses the demands of the Merdeka Curriculum. An explanatory sequential mixed-methods design was employed: 62 students completed an adapted TPACK questionnaire ($\alpha = 0.89$), while eight students and four lecturers served as qualitative informants through semi-structured interviews. Additionally, 16 lesson plans were analyzed using a rubric adapted from Harris et al. (2010). The overall TPACK mean score was 3.47 ($SD = 0.52$), categorized as high, yet foundational domains (CK, $M = 3.89$; PK, $M = 3.76$) scored substantially higher than integrative domains (TCK, $M = 3.18$; TPACK, $M = 3.05$). Qualitative findings revealed three barriers: limited technology-integrated microteaching practice, curricular misalignment with Merdeka Curriculum principles, and low student self-efficacy in selecting pedagogically appropriate digital tools. These findings suggest that while foundational knowledge is adequately developed, purposeful technology integration remains underdeveloped. The study recommends TPACK-based curriculum mapping, redesigned microteaching with design-teach-reflect cycles, and systematic reflective practice aligned with Merdeka Curriculum principles.

Keyword: TPACK competence, pre-service English teachers, merdeka curriculum, teacher preparation, mixed methods, technology integration

INTRODUCTION

The question of how well prepared English teachers are when they enter the classroom has never been simple to answer. Teachers must not only understand their subject matter but also possess the ability to teach that knowledge in ways that reach different kinds of learners. In recent years, the Indonesian educational context has undergone significant transformation, particularly with the added expectation that teachers integrate digital technology not as an optional enhancement but as a core part of their instructional repertoire. The *Kurikulum Merdeka*, officially implemented as a national curriculum reform by the Ministry of Education and Culture (Kemendikbudristek, 2022), reflects this shift. Among its principal features are differentiated learning, the *Profil Pelajar Pancasila* project (P5), and student-centered pedagogies, all of which assume that technology will play a meaningful role in day-to-day classroom activities. For pre-service English teachers, graduating under these conditions requires a qualitatively different and more integrated skill set than previous generations of teachers needed.

The academic literature has responded to this challenge by developing frameworks that capture what teachers need to know to teach effectively with technology. Among these, the Technological Pedagogical Content Knowledge (TPACK) framework, introduced by (Koehler et al., 2013), remains the most widely cited and applied. TPACK proposes that effective technology-integrated teaching emerges when a teacher develops the capacity to see how content knowledge, pedagogical knowledge, and technological knowledge interact and reinforce each other within specific instructional situations. The framework distinguishes seven domains: Content Knowledge (CK), Pedagogical Knowledge (PK), Technological Knowledge (TK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and the fully integrated TPACK. (Koehler et al., 2013) clarified that teacher education should move students toward that integrated form rather than treating each domain as a standalone course objective.

Over the past decade, TPACK has been applied extensively in EFL research settings. (Baser et al., 2016) developed and validated a TPACK measurement tool designed for the specific demands of English language teacher education, filling a methodological gap in language-specific TPACK research. (Drajati et al., 2018), whose work focused on Indonesian teachers, identified a pattern subsequently replicated in other settings: teachers tend to score higher on CK and PK than on domains requiring technology to be combined with content or pedagogical strategies. (Mahdum, 2015) observed similar trends among English teachers in

Riau, where familiarity with technology did not reliably translate into purposeful instructional use. More recently, (Nazari et al., 2019) extended this line of inquiry to include differences between novice and experienced teachers, while post-pandemic research (Kaluge & Usmi, 2024); (Santos & Castro, 2021) has stressed that the disruptions of remote teaching created both urgency and new opportunities for rethinking how TPACK is developed in pre-service preparation. (Chai et al., 2013) contributed a systematic review revealing that most TPACK studies focus on self-report measures without triangulating against actual teaching artifacts, a limitation this study explicitly addresses.

Despite this growing body of research, a critical gap persists. Existing studies have not sufficiently examined TPACK development within teacher education programs that are explicitly oriented toward the Merdeka Curriculum, particularly those located in non-metropolitan regions of Indonesia. Most TPACK research in Indonesian settings has been conducted in urban universities with comparatively better access to technology infrastructure and professional development resources (Drajati et al., 2018); (Mahdum, 2015). Furthermore, prior studies have generally treated curriculum policy as a contextual backdrop rather than as an active variable shaping TPACK development. No study has yet investigated how the specific demands of the Merdeka Curriculum - differentiation, project-based learning, and student-centered assessment - interact with TPACK integration in pre-service teacher preparation at the institutional level.

STKIP Yayasan Abdi Pendidikan Payakumbuh, located in Payakumbuh City, West Sumatra, serves as a critical case for addressing this gap. As a non-metropolitan LPTK, it represents a category of institution that produces a substantial proportion of Indonesia's teacher graduates yet remains underrepresented in TPACK research. The institution faces challenges characteristic of regional teacher education: limited access to advanced technology infrastructure, fewer opportunities for faculty professional development in technology-integrated pedagogy, and a student population that will predominantly serve in rural and semi-urban secondary schools where the Merdeka Curriculum is now being implemented. Preliminary observations conducted prior to this study suggested a telling disconnect: students could navigate digital tools, but they struggled to justify those tools pedagogically, especially when asked to design lessons reflecting Merdeka Curriculum principles such as differentiation or student-led projects.

This research contributes to the field by providing the first empirical investigation of TPACK competence within a non-metropolitan Indonesian LPTK operating explicitly under

Merdeka Curriculum mandates. Unlike prior studies that have examined TPACK in isolation from curriculum policy, this research positions the Merdeka Curriculum as a central analytical frame, examining how its principles create specific demands on pre-service teachers' integrated knowledge. The mixed-methods design further adds methodological value by triangulating self-report survey data with interview accounts and artifact analysis of actual lesson plans.

Three research questions guided the inquiry. First, given that existing research consistently shows gaps between foundational and integrative TPACK domains, at what level of TPACK competence do pre-service English teachers at STKIP Yayasan Abdi Pendidikan Payakumbuh currently perform across the seven domains? This question addresses the need for baseline data from non-metropolitan LPTKs. Second, given the documented pattern of delayed curriculum reform absorption in Indonesian LPTKs (Latifa et al., 2023), in what concrete ways does the current curriculum and instruction in the study program support or hinder preparation for Merdeka Curriculum-aligned teaching? Third, given that self-efficacy has been identified as a key mediating factor in technology integration (Ertmer & Ottenbreit-Leftwich, 2010), what specific barriers do students encounter when attempting to apply TPACK in lesson planning and teaching practice?

METHOD

Research Design

This research employed a mixed-methods explanatory sequential design (Creswell & Plano-Clark, 2018). The quantitative phase was implemented first to obtain a numerical picture of students' TPACK competence levels. The qualitative phase followed with the specific purpose of interpreting and explaining the quantitative results. Specifically, the quantitative finding that integrative domains (TCK, TPK, and TPACK) scored substantially lower than foundational domains (CK, PK, TK) informed the development of interview protocols that probed why integration proved challenging and what institutional conditions contributed to this pattern. The combination of these two phases was necessary because neither a survey alone nor interviews alone would have been sufficient to answer all three research questions comprehensively.

Research Site and Participants

The research was carried out at the English Language Education Study Program of STKIP Yayasan Abdi Pendidikan Payakumbuh in West Sumatra, during the odd semester of the 2025/2026 academic year. For the quantitative phase, all 62 students from semesters five, six, and seven who met the course-completion criteria were included, constituting a total population sample. This approach was appropriate given the bounded and accessible population; all eligible students were invited and participated. The sample size of 62 is consistent with comparable TPACK survey studies in Indonesian EFL contexts that have employed similar instruments with samples ranging from 50 to 80 participants (Drajati et al., 2018); (Mahdum, 2015). The sampling criterion required that participants had completed courses central to pedagogical and technological preparation: Learning and Instruction (*Belajar dan Pembelajaran*), TEFL, CALL, and Microteaching. For the qualitative phase, eight students were selected through stratified purposive sampling to represent the range of TPACK scores (two from each quartile), and four lecturers responsible for the aforementioned courses were recruited as key informants. Table 1 presents the participant demographics.

Table 1: Participant Demographics
(N = 62 for Quantitative; N = 12 for Qualitative)

Characteristic	Category	n	%
Gender	Male	18	29.0
	Female	44	71.0
Semester	5th	22	35.5
	6th	21	33.9
	7th	19	30.6
Qualitative Informants	Students	8	-
	Lecturers	4	-

Research Instruments

Data collection relied on two primary instruments. The first was an adapted questionnaire measuring TPACK competence in the EFL context, constructed by drawing on the validated tools developed by (Baser et al., 2016) and (Drajati et al., 2018). The adapted version contained 42 items distributed across the seven TPACK domains, each rated on a scale from 1 (strong disagreement) to 5 (strong agreement). Before administration, two lecturers in English language teaching and educational technology reviewed items for content

validity, and the instrument was piloted with 20 students. The Cronbach's alpha coefficient obtained from the pilot was 0.89, indicating reliable internal consistency.

The second instrument was a semi-structured interview guide developed from the research questions and reviewed by the same expert lecturers. The guide explored students' experiences in courses involving technology, their understanding of the Merdeka Curriculum's instructional implications, and difficulties encountered in designing technology-integrated lessons. To complement these data sources, 16 lesson plans produced during the Microteaching course were collected and evaluated using a rubric adapted from (J. Harris et al., 2010). The rubric assessed four specific indicators: (a) content accuracy and appropriateness for the stated learning objective, (b) pedagogical alignment between the instructional strategy and the learner profile, (c) technology appropriateness and the extent to which the selected digital tool genuinely enhanced the learning activity, and (d) Merdeka Curriculum integration, specifically whether the lesson plan reflected principles such as differentiation, project-based learning, or the P5 framework. The 16 lesson plans were selected through stratified purposive sampling based on students' TPACK score quartiles, with four plans drawn from each quartile to ensure representation across competence levels.

Data Collection Procedures

Data were collected in three sequential stages. The questionnaire was first distributed through Google Forms and completed by all 62 participants. Next, eight students representing the range of TPACK scores and four lecturers participated in individual interviews of 40 to 60 minutes each. Each session was audio-recorded after obtaining informed consent and later transcribed verbatim. In the final stage, the 16 stratified lesson plan documents were gathered for analysis, providing a concrete artifact-based dataset to cross-reference with self-reported questionnaire scores.

Data Analysis

The questionnaire data were analyzed using SPSS version 26, computing mean scores, standard deviations, and percentages for each domain. Score interpretation followed the categorical scale used by Drajadi et al. (2018): 1.00–1.80 (very low), 1.81–2.60 (low), 2.61–3.40 (moderate), 3.41–4.20 (high), and 4.21–5.00 (very high). For the qualitative data, thematic analysis was conducted following the six-step procedure described by (Braun, 2013): familiarization with data, generating initial codes, searching for themes, reviewing themes,

defining and naming themes, and producing the report. Trustworthiness was ensured through triangulation across three source types (questionnaire responses, interview transcripts, and lesson plan documents), member checking with a selection of participants, and peer debriefing with an independent reviewer.

FINDINGS AND DISCUSSION

Findings

Level of TPACK Competence across Seven Domains

Questionnaire results indicated that the 62 participating pre-service English teachers had an overall TPACK mean score of 3.47 (SD = 0.52), categorized as high. When results were disaggregated by domain, a clear distinction emerged between foundational and integrative domains, as shown in Table 2.

Table 2: Mean Scores, Standard Deviations, and Categories for Each TPACK Domain (N = 62)

TPACK Domain	Mean	SD	Category	Rank
Content Knowledge (CK)	3.89	0.46	High	1
Pedagogical Knowledge (PK)	3.76	0.48	High	2
Technological Knowledge (TK)	3.58	0.53	High	3
Pedagogical Content Knowledge (PCK)	3.52	0.50	High	4
Technological Pedagogical Knowledge (TPK)	3.31	0.55	Moderate	5
Technological Content Knowledge (TCK)	3.18	0.57	Moderate	6
Integrated TPACK	3.05	0.58	Moderate	7
Overall	3.47	0.52	High	-

Table 2 shows that CK received the highest mean score (M = 3.89), followed by PK (M = 3.76) and TK (M = 3.58), all categorized as high. PCK was also rated as high (M = 3.52). In contrast, TPK (M = 3.31), TCK (M = 3.18), and integrated TPACK (M = 3.05) fell in the moderate range. The gap of nearly one full scale point between CK and integrated TPACK is noteworthy, particularly given that participants were in the later stages of their degree program. This pattern suggests that while students have developed solid individual knowledge bases, integrating these domains into coherent lesson design remains a substantial challenge.

How the Program Prepares Students for the Merdeka Curriculum

Analysis of interview and lesson plan data produced three recurring themes describing the current state of the program's preparation for Merdeka Curriculum-oriented teaching.

The first theme, theoretical coverage without practical application, captures a situation in which Merdeka Curriculum topics appear regularly in courses like Learning and Instruction, Curriculum Analysis, and Microteaching, but primarily at the level of concepts and policy principles. Differentiation, for instance, is discussed as an important principle but rarely operationalized into actual English lesson designs within course activities. One student (S3, 6th semester) articulated this experience clearly: *"We learn about the Merdeka Curriculum in theory, but when it comes to designing English lessons, we still rely on the same old template."* Another student (S7, 7th semester) added: *"The lecturers explain differentiation and P5, but we never actually practice making a lesson plan that uses those ideas with real English materials."* A lecturer (L2) corroborated this assessment: *"We cover the Merdeka Curriculum in our syllabi, but honestly, the assignments have not been updated to require students to design lessons using its principles. The policy moved faster than our course redesign."*

The second theme concerns the fragmented introduction of digital tools across the program. Students encountered various platforms including Google Classroom, Canva, Quizizz, Kahoot, and Padlet. However, each tool was introduced within a particular course without being connected to a broader framework for serving specific language learning goals. Student S1 (5th semester) noted: *"I know how to use Canva and Quizizz, but if you ask me why I would choose one over the other for a reading lesson versus a speaking lesson, I honestly cannot explain it."* Lecturer L4 acknowledged: *"We encourage students to use technology, but we do not yet have a systematic guide that helps them match tool choices to pedagogical objectives or content requirements."* This arrangement produced a pattern in which students selected tools based on familiarity and comfort rather than instructional logic.

The third theme involves the role of Microteaching as the closest approximation to an integrated TPACK learning experience. Of the 16 lesson plans analyzed, 11 included at least one digital tool. However, only 5 demonstrated a clear and reasoned connection between the chosen tool, the English learning objective, the instructional strategy, and relevant Merdeka Curriculum features. For example, one well-aligned plan (from a high-scoring student) used Padlet for a collaborative writing task where students contributed to a shared narrative, with differentiated prompts for varying proficiency levels, a genuine integration of technology, content, and Merdeka Curriculum differentiation principles. In contrast, a typical misaligned plan simply used Quizizz for vocabulary review at the end of a grammar-focused lesson, with no differentiation and no connection between the tool and the stated learning objective.

Student S5 (6th semester) reflected: *"In Microteaching, we are evaluated mostly on whether we can manage the class and deliver the material. Nobody really asks why we chose a particular app or how it connects to the Merdeka Curriculum goals."*

Challenges Reported by Students and Lecturers

Three challenges appeared consistently across the qualitative data. The first was the limited number of structured opportunities for technology-integrated practice. Both students and lecturers noted that Microteaching sessions placed the majority of evaluative weight on general pedagogical skills, with little expectation that students demonstrate a deliberate combination of all three TPACK components. Student S2 (5th semester) explained: *"We only do Microteaching once, and the focus is on classroom management and lesson delivery. There is no time to experiment with technology integration."* Lecturer L1 added: *"The Microteaching rubric does not have specific criteria for assessing how well students integrate technology with content and pedagogy. It is something we notice informally but do not evaluate systematically."*

The second challenge related to the structural disconnect between course offerings and Merdeka Curriculum demands. Although the curriculum appeared as a discussion topic in several courses, syllabi had not been updated to embed its principles into TPACK-related learning activities. Lecturer L3 observed: *"Each of us teaches our course independently. There is no coordination to ensure that what students learn about the Merdeka Curriculum in one course is reinforced and applied in another."*

The third challenge was students' low self-efficacy in selecting appropriate digital tools for specific English language teaching tasks. Students frequently expressed uncertainty about whether a particular tool was suitable for a speaking activity versus a reading comprehension task, or whether it would work with mixed-ability groups. Student S8 (7th semester) stated: *"There are so many tools available, but I do not feel confident choosing the right one. What if I pick something that does not actually help students learn? I would rather just use a PowerPoint that I know works."* This doubt was significant enough that many students avoided technology-integrated lessons in high-stakes situations, defaulting to conventional approaches they felt safer with.

Discussion

What the TPACK Profile Reveals

The pattern in which CK, PK, and TK scored higher than integrative domains is consistent with findings in Indonesian settings (Drajati et al., 2018); (Mahdum, 2015) and in EFL contexts internationally (Nazari et al., 2019); (Schmid et al., 2020). This consistency across diverse institutional contexts suggests that the gap between domain-specific and integrated knowledge is a structural feature of teacher education programs organized around discrete courses, rather than a problem unique to any single institution. However, the present study adds a dimension not explored in prior work: the gap is amplified in a regional LPTK where limited technology infrastructure constrains the opportunities for authentic practice. Unlike urban institutions studied by (Drajati et al., 2018), where students could access technology labs and diverse digital platforms, students at STKIP Yayasan Abdi Pendidikan Payakumbuh reported relying primarily on personal smartphones and freely available tools, which narrowed the range of technology integration they could explore.

The finding that integrated TPACK scored lowest warrants deeper interpretation. (Mishra & Koehler, 2006) were explicit that integrated TPACK is a qualitatively different kind of knowledge that cannot be assumed to develop automatically once its component parts are in place. It requires deliberate situations in which teachers solve the problem of how to teach specific content, to specific learners, in ways genuinely enhanced by specific technology. (Voogt et al., 2013) reinforced this point by arguing that TPACK development depends on deliberate educational design, including opportunities to observe experienced practitioners, collaborate on lesson design, and reflect critically on teaching decisions. The present data suggest that these conditions are largely absent in the studied program, not because of institutional negligence, but because the shift from discrete-course delivery to integrated experiential learning requires a systematic redesign that has not yet occurred. An alternative explanation might attribute low integration scores to students' general technological inexperience; however, the relatively high TK scores ($M = 3.58$) contradict this interpretation, indicating that the challenge lies specifically in integration rather than technological competence per se.

Mapping Merdeka Curriculum Principles to TPACK Domains

A theoretical contribution of this study is the explicit mapping of Merdeka Curriculum demands to TPACK integration requirements. The Merdeka Curriculum's emphasis on

differentiated learning requires teachers to assess learner variability and design multiple pathways to the same learning objective—a task that demands strong PCK and, when technology is involved, fully integrated TPACK. The P5 project requires interdisciplinary, collaborative, and often technology-mediated approaches to learning that draw simultaneously on CK, TPK, and TCK. Student-centered assessment, another pillar of the Merdeka Curriculum, assumes teachers can leverage digital tools for formative assessment and adaptive feedback, which situates the demand squarely within the TPK and TPACK domains. This mapping reveals why the moderate scores in integrative domains are particularly problematic in the Merdeka Curriculum context: the curriculum's core principles are precisely those that demand the highest levels of knowledge integration. Programs that develop foundational TPACK domains adequately but leave integration to chance will produce graduates who understand Merdeka Curriculum principles conceptually but cannot enact them instructionally, exactly the pattern observed in this study.

Linking Program Design to the Merdeka Curriculum

The three qualitative themes are interconnected and reflect a challenge extending beyond this particular institution. Research in Indonesian teacher education has documented that national curriculum reforms enter LPTKs through formal policy channels before being absorbed into actual course design and practicum experiences (Kaluge & Usmi, 2024); (Latifa et al., 2023). The Merdeka Curriculum follows this pattern: its principles are discussed in classrooms but have not been operationalized into assignments, rubrics, and learning activities that give students authentic experience with Merdeka Curriculum-oriented instruction. This study extends these observations by demonstrating that the gap between policy awareness and pedagogical enactment is particularly pronounced when technology integration is involved, creating a compounded challenge that neither curriculum reform nor technology training alone can resolve.

The data also suggest a productive path forward. Microteaching already exists as a space where students practice the complex, multi-element teaching that TPACK describes. (J. B. Harris & Hofer, 2011) described an activity types approach in which teachers plan lessons by first identifying the type of learning activity, then selecting technology that best supports it. Applied to Microteaching, this would mean guiding students through a principled planning sequence. When combined with peer observation, structured reflection, and explicit Merdeka Curriculum alignment criteria, the potential for genuine TPACK development increases

substantially. (Hew & Brush, 2007) identified similar institutional barriers in their review and recommended that programs address technology integration as a systemic issue rather than an individual course addition.

Responding to the Three Challenges

Each challenge identified has a corresponding realistic response grounded in the literature. The challenge of limited integrated microteaching practice can be addressed by redesigning the course to include design-teach-reflect cycles (Angeli & Valanides, 2009), where students plan a technology-integrated lesson, teach it to peers, receive structured feedback, and revise before teaching again. (Mouza et al., 2014) demonstrated that such cyclical approaches in pre-service programs produced measurable gains in TPACK integration.

The curricular misalignment challenge calls for a mapping exercise connecting course learning outcomes to TPACK domains and Merdeka Curriculum competencies. The Learning and Instruction course is strategically positioned for this, since it introduces the theoretical foundations supporting both good pedagogy and Merdeka Curriculum principles. If assignments required students to plan differentiated or project-based English lessons using appropriate digital tools, the connection between theory and practice would become concrete.

The self-efficacy challenge requires intervention focused on building practical confidence rather than conceptual knowledge. Guided exposure to a carefully selected set of tools, supported by structured decision-making tasks requiring students to justify tool choices against specific teaching goals, can gradually build the situated judgment central to effective technology integration (Ertmer & Ottenbreit-Leftwich, 2010). (Tondeur et al., 2012) found in their synthesis that programs combining authentic practice with reflective support are consistently more effective than those addressing technology use only at the skill-training level.

Limitations

Several limitations should be acknowledged. First, the quantitative data relied on a self-report questionnaire, which may be subject to social desirability bias and may not accurately reflect students' actual TPACK competence in practice. While the lesson plan analysis provided partial triangulation, direct classroom observation of students teaching with technology was not conducted. Second, the study was conducted at a single institution, which

limits the generalizability of findings to other regional LPTKs with different institutional characteristics. Third, the cross-sectional design captured TPACK competence at a single point rather than tracking developmental trajectories over time. Fourth, the qualitative sample, though purposively selected, was relatively small, and additional perspectives from school-based mentors or cooperating teachers during practicum could have enriched the analysis.

CONCLUSION AND SUGGESTION

This research reveals that pre-service English teachers at STKIP Yayasan Abdi Pendidikan Payakumbuh possess adequate foundational TPACK competence but have not yet developed the integrated knowledge necessary for effective, technology-supported Merdeka Curriculum teaching—a gap that reflects structural features of how teacher education programs are organized around discrete courses rather than integrated experiences. The study's theoretical contribution lies in demonstrating that the Merdeka Curriculum's core demands, differentiation, project-based learning, and student-centered assessment, map directly onto the integrative TPACK domains where students scored lowest, revealing a critical misalignment between curriculum policy expectations and institutional preparation. Practically, this means that programs cannot develop graduates' readiness for the Merdeka Curriculum by treating technology integration, pedagogical theory, and curriculum literacy as separate course objectives; they must be woven together through redesigned practicum experiences that include iterative design-teach-reflect cycles with explicit TPACK and Merdeka Curriculum alignment criteria. The most strategic recommendation is to restructure the Microteaching course as the primary site for this integration, supported by cross-course TPACK domain mapping and collaborative module development between English education and educational technology faculty. Future research should employ longitudinal and design-based approaches to track whether such restructured programs produce measurable improvements in integrated TPACK competence across similar regional LPTKs in Indonesia.

ACKNOWLEDGMENTS

The authors express sincere gratitude to the chairman of STKIP Yayasan Abdi Pendidikan Payakumbuh, particularly the Head of the English Language Education Study Program, for the institutional support that made this research possible. Appreciation is extended to the lecturers and students whose participation and responses were essential to this research.

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