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Constructing Pedagogical Identity Through Local Culture-Based English Materials among Pre-Service Mathematics Teachers

Maria Ulpah[1], Muflihah[2], Yusiana Rahman[3], Anam Fauzi[4]
[1,2,3,4]Universitas Islam Negeri Prof. K. H. Saifuddin Zuhri Purwokerto, Purwokerto, Indonesia

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ABSTRACT

In mathematics teacher education, English learning is often treated primarily as a linguistic requirement rather than as a pedagogically meaningful component of professional preparation. Consequently, English courses frequently contribute little to the development of pedagogical identity among pre-service mathematics teachers. This study aims to examine how local culture–based English learning materials function as a pedagogical space for the construction of pedagogical identity among pre-service mathematics teachers. This research employed a qualitative descriptive approach conducted in an English for Mathematics Learning course involving 80 sixth-semester pre-service mathematics teachers. Data were collected through open-ended questionnaires, classroom observations, and students' written reflections embedded in culturally contextualized learning activities, and were analyzed using thematic analysis. The findings reveal that integrating local culture into English learning materials supports pedagogical identity development by encouraging culturally situated learning, reframing English as a pedagogical tool for explaining mathematical concepts, strengthening pedagogical confidence, and promoting reflective and collaborative learning practices. Cultural familiarity also reduces linguistic anxiety and enables students to position themselves more confidently as future mathematics teachers. These findings highlight the role of local culture as an epistemic and affective resource that supports participation, strengthens instructional confidence, and facilitates the development of pedagogical identity within mathematics teacher education.

Corresponding Author:

Maria Ulpah
Tadris Matematika, Fakultas Tarbiyah dan Ilmu Keguruan, Universitas Islam Negeri Prof. K. H. Saifuddin Zuhri Purwokerto
Email: maria_1511@uinsaizu.ac.id

1. INTRODUCTION

In contemporary teacher education, English has become an increasingly important gateway to academic resources, professional networks, and global knowledge exchange.

For pre-service mathematics teachers, this demand is particularly salient because mathematical ideas circulate internationally through English-dominant textbooks, research articles, and digital learning resources. However, engaging with English in a mathematics teacher education context is rarely straightforward. Empirical evidence from Indonesian higher education indicates that students of mathematics education often struggle to interpret English learning resources, decode mathematical and general English terminology, and communicate mathematical reasoning in English [1].

These challenges indicate that English learning for pre-service mathematics teachers should not be treated merely as a general language requirement but must be designed as a pedagogically meaningful space that supports disciplinary communication and future teaching practice. Despite the growing importance of English for accessing mathematical knowledge and engaging in professional discourse, many teacher education programs still position English courses as linguistic support subjects rather than as integral components of pedagogical preparation. As a result, English instruction often fails to meaningfully contribute to the development of pedagogical identity among pre-service teachers.

At the same time, teacher education research has emphasized that becoming a teacher is not merely the accumulation of skills but also the construction of professional/pedagogical identity, shaped through learning experiences, institutional discourses, and sociocultural contexts [2]. Identity formation is especially relevant for pre-service teachers because they continuously negotiate who they are and whom they aim to become as educators while participating in coursework, practicum, and curriculum encounters. Recent qualitative work in Indonesia demonstrates that emotions, reflection, and situated experiences during teacher preparation contribute to how pre-service teachers position themselves and make sense of their emerging professional selves [3]. Consequently, learning environments, including instructional materials, can be understood not only as content carriers but also as identity-shaping mediational tools.

Within this discourse, culturally relevant and culturally sustaining pedagogies offer a powerful lens for designing learning experiences that honor learners' cultural repertoires while sustaining meaningful community practices [4]. Systematic evidence also suggests that culturally responsive pedagogy supports engagement, belonging, and learning by recognizing students' backgrounds and adapting instruction accordingly [5]. In teacher education, culturally responsive preparation has been linked to teachers' confidence and readiness to enact culturally responsive practices in schools [6]. These insights imply that culturally grounded instructional design is not an "add-on" but a pedagogical strategy that can strengthen relevance, agency, and identity development.

In English language education, the integration of local culture into learning materials has gained traction because locally meaningful content can reduce psychological distance, enhance motivation, and position language learning as a socially situated practice. Recent evidence from Indonesia shows that pre-service teachers can meaningfully integrate local cultural dimensions, products, practices, and perspectives into English teaching materials, thereby advancing culturally responsive teaching goals [7]. Likewise, research highlights the urgency and pedagogical rationale for developing local-culture-based EFL

classroom materials to make learning more contextual and relevant [8]. For mathematics teacher candidates, this approach becomes even more strategic: culturally embedded tasks (e.g., local artifacts, traditions, community narratives) can serve as authentic contexts for communicating mathematical meanings in English, while also nurturing an educator identity that is culturally attentive and contextually responsive.

Recent studies have increasingly emphasized the role of contextualized English materials in supporting disciplinary learning and the formation of professional identity among pre-service teachers. Research on English for Mathematics Education has shown that locally contextualized materials significantly enhance students' comprehension, motivation, and disciplinary literacy [9]. These studies consistently report that integrating mathematical content into meaningful contexts, such as daily-life problems, visuals, and interactive tasks, supports learners' engagement and conceptual understanding. Parallel to this strand, local culture–based English materials have been widely examined in language education, demonstrating their effectiveness in promoting cultural awareness, learner confidence, and communicative competence [10], [11], [12]. However, most of these studies focus either on language outcomes or instructional effectiveness, paying limited attention to how such materials contribute to the construction of pedagogical identity, particularly among pre-service teachers in non-language disciplines. Recent interdisciplinary work suggests that culturally grounded learning experiences enable pre-service teachers to negotiate their dual identities as content specialists and future educators, fostering reflective, confident, and context-sensitive pedagogical orientations [13], [14].

Nevertheless, empirical research that explicitly links local culture–based English materials, mathematics pedagogy, and pedagogical identity formation remains scarce. Addressing this gap, the present study builds upon prior development-oriented research by positioning local culture not merely as contextual support, but as a formative medium through which pre-service mathematics teachers construct their professional and pedagogical identities. Therefore, a significant gap remains in the literature regarding how culturally contextualized English materials function as a space where pre-service mathematics teachers negotiate and construct their pedagogical identities. Existing research rarely examines the intersection between language learning, mathematics pedagogy, and teacher identity formation within culturally grounded instructional settings. Addressing this gap, the present study aims to explore how local culture-based English materials contribute to the construction of pedagogical identity among pre-service mathematics teachers. Specifically, this study investigates how culturally contextualized English learning activities shape students' perceptions, confidence, and self-positioning as future mathematics educators.

Despite this growing scholarship, studies on "English for Mathematics" in Indonesian higher education still tend to prioritize product development and practicality/validity outcomes, leaving the identity dimension underexplored. For instance, recent R&D work has developed an English-for-mathematics textbook infused with local wisdom, arguing that localized ESP content can bridge linguistic competence with cultural relevance, thereby increasing engagement [15]. However, fewer studies have examined how such materials become a site where pre-service mathematics teachers construct

pedagogical identity, that is, how they reframe themselves as future teachers who can connect language, mathematics, and culture in meaningful classroom practices.

Against this backdrop, the present study investigates how local culture-based English materials function as an identity-forming pedagogical space for pre-service mathematics teachers. Building on a development-oriented project conducted in an Indonesian teacher education setting, this article qualitatively explores participants' experiences and meaning-making processes as they engage with culturally contextualized English materials designed for mathematics teacher education. By foregrounding identity construction, the study contributes to current conversations on culturally responsive teacher education. It offers implications for designing English materials that are not only usable and effective, but also transformative for how future teachers see themselves and their pedagogical commitments.

By examining identity formation within culturally grounded English learning environments, this study seeks to provide insights into how instructional materials can function not only as learning resources but also as pedagogical spaces that support professional identity development. The findings are expected to contribute to discussions on culturally responsive teacher education, english for Specific Purposes (ESP), and mathematics teacher preparation, particularly in contexts where language, culture, and disciplinary knowledge intersect.

2. METHOD

This study employed a qualitative descriptive design to explore how local culture–based English learning materials contribute to the construction of pedagogical identity among pre-service mathematics teachers. The research was conducted in the English for Mathematics Learning course at the Mathematics Education Study Program of Universitas Islam Negeri Prof. K. H. Saifuddin Zuhri Purwokerto, Central Java, Indonesia. The participants consisted of 80 sixth-semester pre-service mathematics teachers enrolled in the course. All students attending the course were invited to participate in the study, and participation was voluntary. Therefore, the sampling strategy can be categorized as convenience sampling, as participants were selected based on their availability within the course context.

Data were collected through three complementary techniques, namely open-ended questionnaires, classroom observations, and students' written reflections embedded in culturally contextualized learning activities. The questionnaires captured students' perceptions of their learning experiences, their confidence in using English for mathematical communication, and their self-positioning as future teachers. Classroom observations focused on students' participation, interaction patterns, and the ways they used English to explain mathematical concepts within culturally familiar contexts. In addition, reflective responses provided insights into how students interpreted the relationship between culture, language, mathematics, and their emerging pedagogical roles. The instructional materials used in the course integrated elements of Banyumas local culture, such as traditional arts, culinary practices, and local landmarks, into English texts and mathematics-related learning tasks.

The collected data were analyzed using thematic analysis. The analysis began with repeated reading of all data sources to gain a comprehensive understanding of participants' experiences. Initial coding was then conducted to identify meaningful units of data related to pedagogical awareness, participation patterns, confidence in using English, and students' emerging teacher identities. Similar codes were subsequently grouped into broader categories, which were then organized into themes representing key aspects of pedagogical identity construction. This iterative process allowed themes to emerge inductively from the data. To enhance the trustworthiness of the findings, data triangulation was applied by comparing information obtained from questionnaires, observations, and reflective writings. In addition, researcher validation was conducted through collaborative discussions among the research team during the coding and theme development process to ensure the credibility and consistency of the interpretations. Ethical considerations were addressed by ensuring voluntary participation and maintaining the anonymity of all participants.

3. RESULTS AND DISCUSSION

3.1 Results

The results of this study indicate that local culture–based English materials play a significant role in shaping the pedagogical identity of pre-service mathematics teachers. Analysis of questionnaire responses, classroom observations, and students' written reflections reveals several interrelated findings.

First, students demonstrated a shift in self-positioning when engaging with culturally situated learning tasks. Culturally familiar contexts, such as traditional foods (Figure 1), local arts, and regional landmarks, enabled students to participate more actively in English-mediated mathematical explanations. Many students who initially identified themselves as hesitant English learners began to express ideas more confidently and to frame explanations from a teacher's perspective. This suggests that culturally grounded tasks supported students' movement toward an emerging pedagogical identity. Importantly, this shift was not merely linguistic but pedagogical, as students increasingly oriented their explanations toward imagined learners rather than toward task completion alone. Cultural familiarity appeared to lower affective barriers, allowing students to focus on instructional clarity, sequencing, and conceptual accessibility. Through repeated engagement with culturally meaningful tasks, students enacted teacher-like discourse practices, signaling early forms of professional self-recognition as future mathematics educators.

Example 4:
In the traditional event "Ngapati", people often serve *jenang* (a type of thick porridge) in bamboo containers called *takir*. Suppose a *takir* is shaped like a perfect cylinder with a height of 12 cm and a diameter of 10 cm. If Mbah Sarti wants to serve *jenang* in 20 *takir*, how many liters of jenang does she need to prepare in total?

Source: banyumas.suaramerdeka.com
Picture 2.6 Traditional Food "*Jenang*"

Figure 1. Exercises regarding the volume of solid geometry with a traditional food theme

Students reported that culturally familiar contexts reduced the cognitive burden of interpreting English-language learning materials. Instead of struggling to understand unfamiliar situations, they were able to focus on expressing mathematical ideas. As one student explained:

"Using examples from traditional Banyumas food made it easier for me to explain mathematical concepts because I already understood the situation. I only needed to focus on how to say it in English."

This finding suggests that cultural familiarity functions as a cognitive bridge, enabling students to connect language use with mathematical reasoning. The use of culturally contextualized tasks, such as the traditional food problem shown in Figure 1, illustrates how mathematical concepts were embedded in everyday cultural practices. The activity presented in Figure 1 required students to interpret a mathematical problem related to traditional food distribution, encouraging them to describe quantitative relationships while discussing cultural contexts. Such tasks stimulated active engagement and helped students position themselves as participants in meaningful learning experiences.

Second, the results show a reframing of English from a purely linguistic competence to a pedagogical tool. Classroom observations indicate that students are increasingly focused on clarity of explanation, sequencing of ideas, and comprehensibility for learners rather than on grammatical accuracy alone. Students' reflections also reveal that English was perceived as a medium for teaching mathematics rather than as an isolated subject to be mastered. This pedagogical reframing suggests a shift in students' epistemic orientation, positioning language as a resource for meaning-making and instructional mediation. As a result, students began to prioritize communicative effectiveness and learner understanding over linguistic perfection, reflecting an emerging awareness of teacherly responsibility. Such a shift indicates that engagement with English occurred within authentic teaching-oriented practices, enabling students to integrate language use with pedagogical intention and mathematical reasoning.

Third, the use of local culture contributed to increased pedagogical confidence and a sense of instructional authority. Students reported feeling more confident when explaining mathematical concepts through culturally familiar examples, as they perceived themselves as knowledgeable insiders to the content. This confidence was evident in classroom interactions, where students took the initiative to explain, respond to peers'

questions, and justify instructional choices. Notably, many of these interactions were facilitated by culturally contextualized game-based activities (Figure 2), creating an informal yet pedagogically rich environment for engagement. During gameplay, students actively negotiated meaning, clarified rules and concepts, and assumed instructional roles, such as explaining strategies or correcting misunderstandings. These game-based interactions provided a low-anxiety space for sustained participation, further strengthening students' pedagogical confidence and sense of instructional authority.

Cultural familiarity served as an epistemic anchor, legitimizing students' instructional voices and enabling them to claim authority in English-mediated mathematical discourse. By drawing on shared cultural references, students reduced uncertainty and communicative hesitation, thereby strengthening their willingness to lead explanations and manage instructional interactions. This pattern indicates that local culture not only enhanced comprehension but also supported the emergence of pedagogical agency and professional self-efficacy among pre-service mathematics teachers.

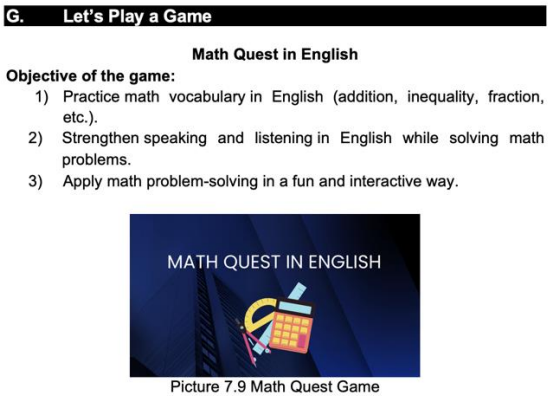

Figure 2. Math games with local culture context

Learning activities required students to describe problem-solving processes, explain mathematical reasoning, and communicate instructions in English. Through these activities, English gradually became part of pedagogical practice rather than an isolated linguistic competence. One student reflected:

"Before this course, I thought English was only about grammar and vocabulary. However, when we practiced explaining mathematics problems in English, I realized that English can help me communicate mathematical ideas to students."

The mathematical game activities illustrated in Figure 2 further reinforced this shift. In the game-based tasks, students were required to discuss strategies, explain solutions, and negotiate answers collaboratively using English. These interactions positioned English as a practical medium for instructional communication in mathematics teaching.

Fourth, reflective responses embedded in learning activities indicate that students developed a heightened awareness of their teaching responsibilities. Reflections reveal sensitivity to learners' perspectives, recognition of potential misconceptions, and consideration of how cultural contexts could support understanding. These reflections suggest that pedagogical identity construction occurred through continuous reflection on practice. Through reflective writing, students not only evaluated the effectiveness of their

explanations but also examined their roles as prospective teachers responsible for facilitating understanding. Reflection functioned as a space for pedagogical rehearsal, where students articulated instructional intentions, anticipated learner difficulties, and aligned cultural examples with mathematical objectives. This ongoing reflective process enabled students to internalize teacher-like ways of thinking, thereby reinforcing pedagogical identity as an evolving, practice-oriented construct.

Fifth, classroom interactions during group discussions and culturally contextualized games revealed that pedagogical identity was also negotiated socially. Students adopted teacher-like discourse, such as simplifying explanations, anticipating learner difficulties, and facilitating peer understanding. Local culture served as a shared reference point, promoting interaction and reducing communicative barriers. These dialogic interactions created a social space in which students could experiment with pedagogical roles and enact emerging teacher identities in real time. Through collaborative meaning-making, students negotiated authority, responsibility, and instructional stance, positioning themselves alternately as learners and facilitators. The presence of shared cultural references supported mutual understanding and legitimized participation, indicating that pedagogical identity developed not only individually but also through socially mediated practice.

Sixth, the findings indicate that local culture–based English materials supported the scaffolding of pedagogical reasoning. Classroom observations show that students gradually structured their explanations more systematically, beginning with contextual introductions, followed by mathematical procedures, and concluding with clarification or reinforcement. Cultural contexts functioned as entry points that helped students organize instructional sequences in English, reducing cognitive overload when explaining abstract mathematical concepts. This scaffolding effect was particularly evident during peer-teaching moments, when students consciously adjusted the depth and pacing of their explanations to suit imagined learner needs. In several instances, students explicitly referenced cultural elements as transitional cues when moving between explanation stages, signaling shifts from contextual understanding to formal mathematical reasoning. Such practices indicate an emerging awareness of instructional flow and coherence, as students increasingly treated explanation as a pedagogical process rather than a spontaneous response. These patterns suggest that culturally grounded materials supported the development of structured pedagogical thinking in English-mediated mathematics instruction.

Seventh, students demonstrated increased awareness of audience and instructional purpose during English-mediated mathematical communication. Questionnaire responses and reflective writings reveal that students became more attentive to whom they were explaining concepts to and why particular explanations were necessary. Rather than producing generalized answers, students increasingly tailored their language use to hypothetical classroom situations, such as addressing common learner misconceptions or simplifying explanations for beginners. This shift indicates that English use was increasingly guided by pedagogical intention rather than task fulfillment alone. Classroom observations further show that students began to anticipate learners' questions and difficulties, adjusting explanations proactively rather than reactively. In several peer-teaching interactions, students explicitly signaled instructional aims, for example, by

stating learning goals or emphasizing key points. These behaviors suggest an emerging alignment between language use and instructional purpose, reinforcing the development of pedagogical intentionality in English-mediated mathematics communication.

Eighth, the integration of local culture encouraged sustained engagement and continuity of participation across learning activities. Observational data indicate that students who were initially passive became more consistently involved in discussions, games, and explanatory tasks when cultural elements were present. Familiar cultural references appeared to foster a sense of belonging and shared ownership of learning activities, which supported ongoing participation over time. This sustained engagement suggests that local culture–based materials functioned not only as motivational triggers but also as stabilizing elements that maintained students' involvement in pedagogical practices. Across multiple sessions, students showed increased willingness to initiate interaction, volunteer explanations, and remain engaged throughout extended activities. Participation was no longer episodic but became more evenly distributed among group members. These patterns indicate that cultural integration contributed to participation stability, allowing pedagogical engagement to be sustained rather than momentary.

3.2 Discussion

The findings demonstrate that pedagogical identity among pre-service mathematics teachers is constructed through culturally situated learning experiences rather than through abstract pedagogical instruction alone. Consistent with identity theory in teacher education, identity emerges as a socially situated and practice-based process shaped by context and participation [16], [17]. In this study, local culture provided a shared symbolic and epistemic space that legitimized students' participation and encouraged them to envision themselves as pedagogical agents. Culturally grounded tasks enabled students to move from peripheral participation to more central, teacher-like roles as they actively explained, mediated, and justified instructional choices. Through repeated participation in these practices, pedagogical identity was enacted and reinforced as a lived experience rather than as an abstract self-concept [18], [19]. This finding underscores the importance of designing teacher education experiences that integrate culture, practice, and reflection as interconnected dimensions of identity construction.

The reframing of English from linguistic competence to a pedagogical tool aligns with research in English for Specific Purposes and disciplinary literacy, which emphasizes that professional identity is strengthened when language learning is embedded in authentic disciplinary practices [1], [20]. By engaging with culturally meaningful mathematical contexts, students were able to integrate language, content, and instructional intention, supporting the development of pedagogical discourse awareness [16], [21]. This integration allowed students to perceive English not as an external requirement but as an integral component of their future teaching practice. As students increasingly oriented their language use toward explaining concepts and facilitating understanding, English became part of their pedagogical repertoire rather than a separate skill domain. Such a shift reinforces the view that disciplinary language learning can serve as a key mechanism for enacting and consolidating pedagogical identity.

The increased pedagogical confidence observed in this study supports prior findings that culturally responsive materials enhance professional self-efficacy and instructional authority [22], [23]. Cultural familiarity positioned students as epistemic insiders, enabling them to claim an instructional voice and negotiate authority in English-mediated mathematics instruction. This finding reinforces the view that culture can function as an epistemic resource rather than merely as contextual decoration [24], [25]. When students drew on culturally shared knowledge, they were able to ground mathematical explanations in familiar meanings, reducing uncertainty and strengthening their sense of instructional legitimacy [26]. This epistemic positioning supported the emergence of teacher agency, as students demonstrated greater initiative, decisiveness, and confidence in guiding learning interactions. Consequently, pedagogical identity development was closely tied to students' ability to mobilize cultural resources as sources of knowledge, authority, and professional confidence.

Reflective practice emerged as a key mechanism for identity construction, confirming previous research that highlights reflection as central to teacher identity development [17], [27]. Students' reflections served as spaces for identity rehearsal, where they justified instructional choices, anticipated learner responses, and articulated emerging pedagogical values. This supports the notion that identity is continuously enacted and reshaped through reflective meaning-making. Through sustained reflection, students moved beyond evaluating task performance to examining their evolving roles and responsibilities as future teachers. Reflective activities enabled them to align personal beliefs, cultural considerations, and pedagogical intentions, thereby deepening their professional self-understanding. Such reflective engagement functioned not only as a cognitive process but also as an identity-forming practice that reinforced teacher-like ways of thinking and acting.

Social interaction also played a crucial role in identity negotiation. Group discussions and collaborative tasks created dialogic spaces in which students experimented with teacher roles, consistent with identity-in-interaction perspectives [28], [29]. Through culturally mediated interaction, students activated multiple identity positions, as learners, teachers, and cultural insiders, allowing pedagogical identity to emerge dynamically. These interactions enabled students to test and refine pedagogical stances through feedback, negotiation, and shared meaning-making. By alternating between explaining, questioning, and facilitating, students engaged in micro-level identity performances that gradually stabilized into recognizable teacher-like behaviors. This finding highlights that pedagogical identity is not individually possessed but socially co-constructed through participation in culturally and pedagogically meaningful interaction.

The reduction of linguistic anxiety observed in this study aligns with research emphasizing the role of affective factors in teacher identity formation in multilingual contexts [30], [31]. Cultural familiarity reduced perceived risk and evaluative pressure, enabling repeated teacher-like performances that are central to identity construction as practice [32], [33]. As anxiety decreased, students were more willing to take instructional risks, experiment with explanations, and sustain engagement in English-mediated teaching tasks. This affective safety fostered continuity in teacher-like participation, allowing

pedagogical identity to be reinforced through repetition and interaction. Consequently, emotional comfort emerged as a critical condition that enabled the enactment and stabilization of pedagogical identity over time.

These findings support contemporary views of pedagogical identity as fluid, relational, and context-dependent [34], [35]. This study extends the existing literature by demonstrating that locally culture–based English materials can serve as a sustained identity-building infrastructure within mathematics teacher education, rather than as a one-time instructional strategy. By consistently embedding cultural contexts across learning activities, these materials create ongoing opportunities for identity enactment through practice, interaction, and reflection. Pedagogical identity, therefore, emerges not as a fixed outcome but as a continuously negotiated process supported by stable yet meaningful cultural resources. This perspective underscores the potential of culturally grounded English instruction to contribute to long-term professional identity development in teacher education programs.

In addition, this study's findings highlight the importance of instructional continuity in pedagogical identity development. Recent studies emphasize that identity formation among pre-service teachers requires sustained engagement in pedagogically meaningful practices over time, rather than episodic exposure to teaching simulations [36], [37]. The consistent integration of local culture into English-mediated mathematics activities in this study created continuity in the instructional experience, enabling students to enact and refine teacher-like practices repeatedly [38], [39]. This continuity allowed pedagogical identity to develop progressively, reinforcing identity as a process rather than a static outcome.

Moreover, the observed scaffolding of pedagogical reasoning aligns with contemporary research on teacher cognition, which suggests that novice teachers develop instructional thinking through structured explanation, audience awareness, and gradual internalization of pedagogical routines [40], [41]. In this study, culturally familiar contexts served as cognitive anchors that supported the organization of pedagogical reasoning in English. This finding extends prior work by demonstrating that scaffolding is not only a learner-support mechanism but also an identity-forming process through which pre-service teachers learn to think, speak, and act as teachers.

The sustained engagement fostered by local culture–based materials also resonates with recent scholarship on belonging and professional identity in teacher education. Studies have shown that a sense of belonging within learning environments is strongly associated with pre-service teachers' commitment, confidence, and professional self-concept [42], [43], [44]. The use of shared cultural references in this study fostered a collective learning atmosphere in which participation felt legitimate and meaningful. This sense of belonging supported not only engagement but also the emotional conditions necessary for pedagogical risk-taking and identity experimentation.

From a broader perspective, this study contributes to the emerging discourse on culturally responsive teacher education in non-language disciplines. While much of the existing literature focuses on language teachers or general pedagogy, recent calls emphasize the need to examine how disciplinary contexts shape identity development [45],

[46]. By situating English learning within mathematics pedagogy and local culture, this study demonstrates how disciplinary, pedagogical, and linguistic identities intersect in complex ways. This intersection underscores the potential of interdisciplinary, culturally grounded instructional design to support holistic teacher identity development.

Taken together, these findings reinforce the argument that pedagogical identity emerges through the interaction of cultural relevance, disciplinary practice, affective safety, and sustained participation. Local culture–based English materials, therefore, should be understood not merely as instructional innovations but as strategic infrastructures that mediate long-term professional identity formation. This perspective invites teacher education programs to reconsider the role of English courses for non-language majors, positioning them as central sites for pedagogical identity development rather than peripheral skill-based requirements.

4. CONCLUSION

This study demonstrates that local culture–based English materials can function as a pedagogical space that supports the development of pedagogical identity among pre-service mathematics teachers. Rather than acting solely as instructional resources, culturally contextualized materials create opportunities for students to connect language use, disciplinary knowledge, and pedagogical thinking within meaningful learning situations. Through engagement with culturally grounded tasks, pre-service teachers gradually develop greater confidence, reflective awareness, and instructional orientation toward explaining mathematical concepts in English. The findings suggest that integrating local culture into English learning materials encourages students to view English not merely as a linguistic competence but also as a pedagogical tool for communicating mathematical ideas. Cultural familiarity also supports participation, reduces anxiety, and enables pre-service teachers to position themselves more confidently as future educators within instructional interactions. These results imply that English courses in teacher education programs, particularly for non-language disciplines such as mathematics education, should be designed not only to improve language proficiency but also to support professional identity formation. Integrating disciplinary content with culturally meaningful contexts may strengthen students' engagement, pedagogical confidence, and readiness to teach in culturally responsive ways.

However, this study is limited to a single teacher education program involving pre-service mathematics teachers in one Indonesian university. The findings are therefore context-specific and may not fully represent experiences of pre-service teachers in other disciplines, institutions, or cultural settings. In addition, the study focuses primarily on learning experiences within coursework and does not examine how the constructed pedagogical identities are enacted during teaching practicum or professional teaching contexts. Future research is recommended to investigate how pedagogical identities developed through culturally grounded English learning environments influence teaching practices during practicum or early career teaching. Comparative studies across different teacher education programs, disciplines, and cultural contexts would also enrich

understanding of how culturally responsive language instruction contributes to long-term teacher identity development.

More broadly, this study contributes to ongoing discussions about culturally responsive teacher education by highlighting the role of local culture as a meaningful resource in professional learning. By connecting language learning with cultural relevance and pedagogical practice, teacher education programs can prepare future teachers who are not only linguistically capable but also culturally aware and pedagogically responsive to the communities they serve.

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