



Integrating Authentic Tuberculosis Cases into Problem-Based Learning: A Case Study of Analytical Reasoning among Public Health Students

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Abstract:

This qualitative case study explored public health students' analytical reasoning experiences during the implementation of authentic tuberculosis cases in Problem-Based Learning (PBL). The study was conducted in an undergraduate public health program in Indonesia and involved students who actively participated in tuberculosis case discussions, collaborative inquiry, and reflective learning activities. Data were collected through classroom observations, semi-structured interviews, reflective journals, and learning documents, then analyzed using thematic analysis. The findings showed that authentic tuberculosis cases encouraged students to identify core public health problems, interpret contextual factors such as stigma, overcrowding, limited health literacy, and healthcare access, and evaluate evidence-based solutions collaboratively. Four major reasoning patterns emerged: contextual understanding, evidence-based analysis, collaborative reasoning, and reflective engagement. The use of authentic cases enabled students to connect theoretical concepts with real community health conditions and strengthened their problem-solving orientation and professional awareness. The study concludes that integrating authentic tuberculosis cases into PBL is an effective strategy for fostering analytical reasoning in public health education. This approach supports deeper learning, meaningful engagement, and preparation for evidence-informed decision-making in professional public health practice.

INTRODUCTION

Public health education in the twenty-first century is increasingly expected to prepare graduates who are capable of responding to complex and dynamic health challenges (Baldovin et al. 2024; Reisner and Todd 2025). Modern public health problems are no longer limited to biomedical dimensions but are closely interconnected with social, environmental, cultural, and behavioral factors (Abdelouahed et al. 2025). Students are required not only to master theoretical knowledge but also to develop analytical reasoning skills that enable them to interpret evidence, evaluate contextual factors, and formulate appropriate solutions for real-world health issues (Liline et al. 2024). In higher education, analytical reasoning has become an essential competency because public health professionals must make informed decisions

based on multifaceted community health data and rapidly changing societal conditions (Hardianto et al. 2026). The growing emphasis on higher-order thinking skills has encouraged universities to adopt learning approaches that promote active inquiry, critical reflection, and contextual problem-solving (Faisal et al. 2025; Hardianto et al. 2023). Analytical reasoning allows students to identify causal relationships, analyze health-related information critically, and construct evidence-based arguments in addressing community health problems (Salim et al. 2025).

Tuberculosis (TB) remains one of the most significant public health challenges worldwide, particularly in developing countries such as Indonesia (Fathimah et al. 2024). According to the World Health Organization, Indonesia continues to rank among the countries with the highest burden of tuberculosis cases globally. The persistence of TB is influenced not only by medical factors but also by various social determinants, including poverty, overcrowded living conditions, limited access to healthcare services, low health literacy, and treatment non-adherence (Nguyen 2021; Sany 2022). These multidimensional characteristics make tuberculosis a complex public health issue that requires comprehensive analysis and contextual understanding from future public health professionals (Flodgren et al. 2025). In the context of public health education, tuberculosis provides an authentic and relevant learning context for developing students' analytical reasoning abilities (Hsiao et al. 2026). Real-world TB cases enable students to examine epidemiological patterns, identify contributing socio-environmental factors, and evaluate possible intervention strategies within community settings (Fathimah et al. 2024). Furthermore, integrating local tuberculosis cases into classroom learning may strengthen students' awareness of health problems occurring within their own social environments.

Despite the increasing demand for analytical competencies in public health education, conventional learning approaches are still widely implemented in many higher education institutions (Ndendya et al. 2025). Teaching practices often emphasize content transmission, theoretical memorization, and lecturer-centered instruction, where students play relatively passive roles in the learning process. Such approaches may limit opportunities for students to actively explore complex health issues, critically interpret information, and connect theoretical concepts with real-world public health situations (Duong 2020). As a result, students may acquire conceptual knowledge without fully developing the analytical reasoning skills required for addressing multifaceted community health problems (Ghozali 2025). In tuberculosis education specifically, conventional classroom instruction may not adequately expose students to the contextual realities surrounding TB management in communities. Students frequently encounter difficulties in analyzing interconnected factors such as social stigma, environmental conditions, healthcare accessibility, and behavioral aspects influencing tuberculosis transmission and treatment adherence. Moreover, the absence of authentic learning experiences may create a gap between academic understanding and practical public health application.

Problem-Based Learning (PBL) has been widely recognized as a student-centered pedagogical approach that encourages active participation, inquiry, and collaborative problem-solving (Hendriana et al. 2018; Pimdee et al. 2024). In PBL environments, students are positioned as active learners who engage in identifying problems, analyzing relevant

information, discussing possible solutions, and constructing knowledge through investigation and reflection (Sastrawati et al. 2011). This approach shifts the focus of learning from passive knowledge acquisition to meaningful exploration of real-world issues. In public health education, PBL is considered particularly relevant because it mirrors the complex decision-making processes commonly encountered in professional health practice (Septiani and Baharuddin 2024). Previous studies have demonstrated that PBL contributes positively to the development of critical thinking, analytical reasoning, clinical judgment, and problem-solving competencies among health-related students. Through discussion-based and inquiry-oriented activities, students are encouraged to evaluate evidence, interpret contextual data, and formulate reasoned conclusions collaboratively (Leethongdissakul et al. 2024).

Authentic case-based learning has gained increasing attention in higher education because it provides students with opportunities to engage directly with real-world situations and contextual problems (Hardianto et al. 2026). Unlike hypothetical scenarios, authentic cases reflect the complexity, uncertainty, and multidimensional nature of actual public health issues encountered in communities. This learning approach encourages students to connect theoretical knowledge with practical realities, thereby fostering deeper understanding and meaningful learning experiences. In health education, authentic cases can also enhance students' motivation and engagement by exposing them to issues that are socially relevant and professionally significant (Pacaol 2024). Authentic case-based learning may support the development of analytical reasoning by allowing students to examine epidemiological data, social determinants, patient behaviors, and environmental conditions simultaneously. Exposure to real tuberculosis cases enables students to interpret health problems more comprehensively and consider various contextual factors influencing disease prevention and management. Furthermore, authentic learning environments align with constructivist and situated learning perspectives, which emphasize that knowledge is constructed through active interaction with meaningful contexts (Getha-Eby et al. 2014). Therefore, integrating authentic tuberculosis cases into Problem-Based Learning may create richer educational experiences that strengthen students' analytical engagement and contextual problem-solving abilities in public health education.

Although numerous studies have examined the implementation of Problem-Based Learning in health education, most existing research primarily focuses on quantitative outcomes such as academic achievement, learning effectiveness, critical thinking scores, or clinical performance (Lailis et al. 2023; Tsalapatas et al. 2021). Many studies emphasize experimental comparisons between learning models while giving limited attention to students' lived learning experiences and reasoning processes during learning activities (Susiati et al. 2025). In addition, previous research on PBL frequently utilizes hypothetical or generalized scenarios that may not fully capture the complexity of real public health problems encountered in community settings. Consequently, the processes through which students develop analytical reasoning in authentic learning environments remain underexplored. Research specifically investigating the integration of authentic tuberculosis cases into Problem-Based Learning within public health education is still limited, particularly in the Indonesian higher education context. Few studies have employed a qualitative case study approach to explore how students experience analytical reasoning when engaging with real-world tuberculosis issues (Fathimah et al. 2024). Moreover,

there is insufficient understanding of how authentic community-based cases influence students' interpretation of public health problems, contextual analysis, and evidence-based decision-making processes.

Based on the growing need for analytical competencies in public health education, the persistent challenges of tuberculosis management, and the limited exploration of authentic case-based learning in previous studies, this research seeks to examine students' learning experiences within a contextual Problem-Based Learning environment. The integration of authentic tuberculosis cases is expected to provide meaningful opportunities for students to engage with real-world public health issues and develop deeper analytical understanding through inquiry and collaborative discussion. Therefore, this case study explores students' analytical reasoning experiences during the implementation of authentic case-based Problem-Based Learning in tuberculosis education. Specifically, the study aims to understand how students analyze contextual health problems, interpret relevant information, and construct evidence-based reasoning while engaging with authentic tuberculosis cases in public health learning settings.

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Research Design

This study employed a qualitative case study design to explore students' analytical reasoning experiences during the implementation of authentic case-based Problem-Based Learning (PBL) in tuberculosis education. A qualitative case study approach was considered appropriate because it enables an in-depth investigation of a contemporary educational phenomenon within its real-life context (Creswell 2012). The study specifically focused on how public health students engaged in analytical reasoning processes while interacting with authentic tuberculosis cases in collaborative learning settings. By emphasizing contextual understanding and participants' lived experiences, the case study design allowed the researchers to capture complex learning interactions, reasoning patterns, and meaning-making processes that emerged throughout the implementation of authentic PBL activities.

Participants

The study was conducted in a Public Health Study Program at a higher education institution in Baubau City, Indonesia, where tuberculosis-related issues remain relevant within the local public health context. The research was situated within a public health learning course that integrated authentic tuberculosis cases into Problem-Based Learning activities during the academic semester. Participants in this study consisted of undergraduate public health students who were actively involved in the implementation of authentic case-based PBL sessions. The participants were selected purposively based on their direct engagement in tuberculosis case discussions and collaborative analytical activities throughout the learning process. This contextual setting enabled the researchers to explore students' analytical reasoning experiences within a real-world public health learning environment closely connected to local community health challenges.

Data Collecting and Instruments

Data were collected using multiple qualitative techniques to obtain a comprehensive understanding of students' analytical reasoning experiences during the implementation of authentic case-based Problem-Based Learning. The primary data collection methods included classroom observations, semi-structured interviews, reflective journals, and analysis of learning documents. Classroom observations were conducted to examine students' interactions, discussion dynamics, and analytical engagement during tuberculosis case analysis activities. Semi-structured interviews were used to explore students' perspectives, reasoning processes, challenges, and interpretations of authentic public health problems encountered throughout the learning sessions. In addition, students were asked to complete reflective journals to document their learning experiences and analytical reflections. Supporting data were also obtained from learning artifacts such as discussion notes, presentation materials, and written analyses. To support data collection consistency, the researchers utilized observation guidelines, interview protocols, reflective prompts, and document analysis sheets that were developed based on the research objectives and relevant analytical reasoning indicators.

Data Analysis

The collected data were analyzed using thematic analysis to identify patterns and themes related to students' analytical reasoning experiences during authentic case-based Problem-Based Learning activities. The analysis process followed several stages, including data familiarization, coding, theme generation, theme review, and interpretation of findings. Initially, all observation notes, interview transcripts, reflective journals, and learning documents were carefully reviewed to gain a comprehensive understanding of the data. Relevant statements and meaningful units related to analytical reasoning processes were then systematically coded. Subsequently, similar codes were grouped into broader themes representing students' contextual interpretation, evidence-based reasoning, problem analysis, and collaborative analytical engagement. The identified themes were continuously refined and interpreted to develop an in-depth understanding of how students constructed analytical reasoning while engaging with authentic tuberculosis cases in public health learning contexts.

RESULT

To provide contextual information regarding the participants involved in this study (Table 1), demographic and academic characteristics of the students were identified before the implementation of authentic case-based Problem-Based Learning activities. Understanding participant backgrounds was important to support the interpretation of students' analytical reasoning experiences throughout the learning process. The participants consisted of undergraduate public health students with varying levels of prior exposure to Problem-Based Learning and different degrees of engagement during collaborative discussions. Their participation provided diverse perspectives and interactions during the analysis of authentic tuberculosis cases.

Table 1. Participant Characteristics

Participant Code	Gender	Academic Year	Previous Experience with PBL	Level of Participation in Discussion
P1	Female	Third Year	Limited	Active
P2	Male	Third Year	Moderate	Very Active
P3	Female	Second Year	Limited	Active
P4	Female	Third Year	Moderate	Very Active
P5	Male	Second Year	Limited	Moderate
P6	Female	Third Year	Extensive	Very Active
P7	Male	Third Year	Moderate	Active
P8	Female	Second Year	Limited	Moderate
P9	Female	Third Year	Extensive	Very Active
P10	Male	Third Year	Moderate	Active
P11	Female	Second Year	Limited	Active
P12	Male	Third Year	Moderate	Very Active

To support the implementation of authentic case-based Problem-Based Learning, students were exposed to several tuberculosis-related cases derived from contextual public health situations commonly encountered in community settings (Table 2). The authentic cases were designed to represent multidimensional tuberculosis problems involving medical, social, environmental, and behavioral factors. Through these cases, students were encouraged to analyze complex public health issues, interpret contextual information, and formulate evidence-based recommendations collaboratively. The diversity of case themes also enabled students to explore various perspectives related to tuberculosis prevention, transmission, treatment adherence, and community health interventions.

Table 2. Overview of Authentic Tuberculosis Cases Used in Problem-Based Learning

Case Theme	Public Health Issue	Contextual Factors	Learning Focus
Treatment Non-Adherence	Patients discontinuing TB medication before treatment completion	Family support, stigma, limited health literacy	Evidence-based intervention analysis
Urban Tuberculosis Transmission	Increasing TB cases in densely populated settlements	Poor sanitation, overcrowding, environmental conditions	Epidemiological interpretation
Delayed Diagnosis of TB	Late identification of tuberculosis symptoms in communities	Limited healthcare access, low awareness	Public health decision-making
Tuberculosis and Social Stigma	Community discrimination toward TB patients	Cultural perceptions, misinformation, fear of transmission	Social determinant analysis
TB Prevention in Adolescents	Low awareness of TB prevention among youth populations	Health education limitations, risky behaviors	Preventive strategy development

Community-Based TB Control	Challenges in implementing local TB monitoring programs	Community participation, resource limitations	Collaborative problem-solving
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The implementation of authentic case-based Problem-Based Learning revealed several stages of analytical reasoning demonstrated by students throughout the learning process (Table 3). During classroom discussions and collaborative inquiry activities, students gradually engaged in identifying public health problems, interpreting contextual evidence, evaluating alternative solutions, and reflecting on their reasoning processes. These stages illustrated how students constructed analytical understanding while interacting with authentic tuberculosis cases. The observed reasoning patterns also reflected students' efforts to connect theoretical knowledge with real-world public health situations encountered within community contexts.

Table 3. Stages of Analytical Reasoning Observed During Problem-Based Learning

Analytical Reasoning Stage	Student Activities	Observed Indicators
Problem Identification	Identifying core issues within tuberculosis cases	Recognizing multidimensional public health factors
Contextual Interpretation	Examining environmental, social, and behavioral influences	Connecting TB problems with community realities
Evidence Analysis	Interpreting epidemiological information and supporting data	Evaluating the relevance and credibility of evidence
Collaborative Discussion	Exchanging perspectives and negotiating interpretations	Constructing shared analytical understanding
Solution Evaluation	Comparing possible interventions and recommendations	Justifying decisions using contextual evidence
Reflective Reasoning	Reflecting on learning experiences and analytical processes	Reconsidering assumptions and refining conclusions

The thematic analysis of observation data, interview transcripts, reflective journals, and learning documents revealed several recurring themes related to students' analytical reasoning experiences during authentic case-based Problem-Based Learning (Table 4). These themes reflected how students interpreted contextual tuberculosis problems, constructed evidence-based understanding, collaborated in analytical discussions, and developed reflective perspectives throughout the learning process. The identified themes also demonstrated the multidimensional nature of analytical reasoning within authentic public health learning environments.

Table 4. Emergent Themes and Subthemes of Students' Analytical Reasoning Experiences

Main Themes	Subthemes	Representative Meaning
Contextual Understanding	Awareness of social and environmental determinants	Students connected tuberculosis issues with community realities and social conditions
Evidence-Based Analysis	Interpreting and evaluating health-related information	Students critically examined epidemiological data and supporting evidence
Collaborative Reasoning	Negotiating perspectives through group discussion	Students constructed analytical understanding collectively through dialogue
Problem-Solving Orientation	Developing contextual intervention strategies	Students proposed solutions based on real public health conditions
Reflective Engagement	Reevaluating assumptions and prior understanding	Students reflected critically on their reasoning processes and learning experiences
Professional Awareness	Recognizing responsibilities in public health practice	Students developed awareness of the complexity of community health decision-making

DISCUSSION

The findings indicate that authentic tuberculosis cases created meaningful conditions for the development of students' analytical reasoning during Problem-Based Learning. When students were confronted with real-world public health scenarios, they were required to move beyond memorizing factual information and instead identify the core problems, examine related contextual factors, and interpret evidence in a more systematic way. This process encouraged them to consider tuberculosis not as an isolated biomedical issue, but as a complex phenomenon shaped by social, environmental, behavioral, and structural determinants (Fathimah et al. 2024). In this sense, authentic case-based PBL functioned as a learning environment that supported higher-order thinking by requiring students to analyze problems from multiple perspectives before arriving at reasoned conclusions. These findings are consistent with constructivist perspectives, which emphasize that knowledge is actively built through engagement with meaningful problems rather than passively received from instruction (Yakar et al. 2020). The students' reasoning processes also reflected key features of inquiry-based learning, particularly in the ways they questioned assumptions, compared alternative interpretations, and justified proposed solutions using contextual evidence. Such patterns suggest that authentic cases are especially powerful in promoting analytical engagement because they mirror the complexity of real public health practice. The integration of authentic tuberculosis cases into PBL appears to be an effective pedagogical strategy for strengthening students' analytical reasoning and

preparing them for evidence-informed decision-making in professional public health contexts (Wei et al. 2020).

The use of authentic tuberculosis cases in Problem-Based Learning significantly enhanced students' contextual understanding of public health issues. Through exposure to real community-based tuberculosis problems, students became more aware that TB transmission and management are closely associated with social determinants such as poverty, stigma, environmental sanitation, healthcare accessibility, and community behavior. Rather than viewing tuberculosis solely from a biomedical perspective, students demonstrated the ability to interpret the disease within broader social and environmental contexts. This contextual awareness enabled them to analyze public health problems more comprehensively and develop a deeper understanding of the complexity of tuberculosis prevention and control in community settings (Mishra 2024; Raja Adnan et al. 2022). These findings support the principles of authentic learning and situated learning, which emphasize that meaningful knowledge is developed through interaction with real-life contexts and socially relevant experiences. The authentic cases encouraged students to connect theoretical concepts learned in classrooms with actual public health realities encountered in society (Iwan et al. 2025). Such learning experiences appeared to increase students' engagement and analytical involvement because the cases reflected issues that were familiar and relevant to their surrounding environment. In line with experiential learning theory, direct engagement with contextual problems may facilitate deeper cognitive processing and strengthen students' ability to apply theoretical knowledge to practical public health situations (Dopico et al. 2021; Tohani et al. 2019). Therefore, authentic case-based learning can serve as an important pedagogical approach for creating more meaningful and contextually relevant public health education.

Collaborative discussion emerged as an important component in supporting the development of students' analytical reasoning during authentic case-based Problem-Based Learning activities. Throughout the learning process, students actively exchanged perspectives, debated interpretations, and negotiated possible solutions related to tuberculosis cases presented in class. These interactions encouraged students to articulate their ideas clearly, evaluate alternative viewpoints, and reconsider their assumptions based on arguments presented by peers. The collaborative learning environment also allowed students to construct shared understanding collectively, particularly when analysing complex public health issues involving social, behavioural, and environmental dimensions. This finding aligns with social constructivist perspectives, particularly the view that knowledge is developed through social interaction and collaborative meaning-making processes (Barak 2017; Suh and Ahn 2022). Through group discussions, students were not only exposed to diverse interpretations of tuberculosis problems but were also encouraged to justify their reasoning using contextual evidence and public health considerations. The dialogical nature of collaborative inquiry appeared to strengthen students' analytical engagement by promoting critical reflection and deeper examination of the cases being discussed. In this regard, collaborative discussion functioned not merely as a communication activity, but as a mechanism through which analytical reasoning was socially constructed and continuously refined during the learning process.

Reflective engagement played a significant role in deepening students' analytical reasoning during the implementation of authentic case-based Problem-Based Learning. Through reflective activities such as discussion reviews and reflective journals, students were encouraged to reconsider their assumptions, evaluate their reasoning processes, and identify limitations in their understanding of tuberculosis-related issues. Reflection enabled students to move beyond surface-level interpretation by critically examining how they analyzed evidence, interpreted contextual information, and formulated conclusions throughout the learning process (Robinson and Lin 2025; Runchina et al. 2022). As students reflected on authentic tuberculosis cases, they gradually developed greater awareness of the complexity and interconnectedness of public health problems within community settings. These findings are closely related to reflective learning and metacognitive perspectives, which emphasize the importance of self-awareness in knowledge construction and problem-solving. Reflective engagement allowed students to monitor their own thinking processes and recognize how their perspectives evolved during collaborative inquiry activities. In addition, the reflective process appeared to strengthen students' ability to integrate theoretical concepts with real-world public health realities, thereby supporting more meaningful and transformative learning experiences (Akingbola et al 2025; Ndendya and Liana 2025). This suggests that reflection should not be viewed merely as a supplementary activity in Problem-Based Learning, but rather as an essential pedagogical component that supports deeper analytical reasoning and contextual understanding in public health education.

The findings of this study demonstrate that authentic case-based Problem-Based Learning contributed substantially to the development of competencies required in public health practice. Through engagement with real tuberculosis cases, students developed skills related to evidence-based reasoning, contextual analysis, collaborative problem-solving, and decision-making. The learning activities encouraged students to interpret epidemiological information, evaluate social and environmental determinants, and formulate intervention strategies that were relevant to community health conditions. These competencies are essential for future public health professionals, as public health practice often involves addressing complex and multifactorial health issues that require analytical and context-sensitive approaches. Furthermore, the integration of authentic cases into PBL appeared to bridge the gap between classroom learning and real-world public health realities (Salim et al. 2025). Students were not only exposed to theoretical concepts but were also challenged to apply their knowledge within realistic community contexts. This process supported the development of professional awareness by helping students understand the responsibilities and complexities involved in public health decision-making.

The findings of this study are consistent with previous research demonstrating that Problem-Based Learning contributes positively to the development of critical thinking, collaborative inquiry, and problem-solving skills in health education contexts. Earlier studies have shown that PBL encourages active learning and promotes students' engagement in evidence-based reasoning processes through discussion-oriented and inquiry-driven activities. Similar patterns were identified in this study, where students actively analyzed tuberculosis-related issues, interpreted contextual information, and collaboratively constructed solutions

during authentic case discussions. These findings reinforce the view that PBL provides meaningful opportunities for students to develop higher-order thinking competencies that are essential in public health education (Abdelouahed et al. 2025; Blavos et al. 2025; Taks et al. 2024). However, this study also extends previous research in several important ways. Unlike many earlier studies that focused primarily on quantitative learning outcomes or utilized hypothetical classroom scenarios, the present study emphasized students' analytical reasoning experiences within authentic tuberculosis cases situated in real public health contexts. The use of a qualitative case study approach allowed for a deeper exploration of how students constructed meaning, negotiated interpretations, and developed contextual understanding during the learning process (Joshi et al. 2025). In addition, the Indonesian public health education context, particularly the use of community-related tuberculosis issues in Baubau City, provides a localized and socially relevant perspective that remains underrepresented in existing literature. Therefore, this study contributes novel insights into the role of authentic case-based PBL in fostering analytical reasoning within contextualized public health learning environments.

The findings of this study provide important theoretical contributions to constructivist and situated learning perspectives in higher education. The students' analytical reasoning processes demonstrated that knowledge was actively constructed through engagement with authentic tuberculosis cases, collaborative inquiry, and reflective interaction. Rather than receiving information passively, students developed understanding by interpreting contextual evidence, negotiating meanings with peers, and connecting theoretical concepts with real public health situations (Acosta 2025; Rab et al. 2025). These findings support constructivist assumptions that meaningful learning occurs when students are actively involved in problem-solving activities situated within relevant social and environmental contexts (Adams 2006; Ma et al. 2022; Yakar et al. 2020). In addition, this study strengthens the theoretical relevance of authentic learning and experiential learning in public health education. The integration of real-world tuberculosis cases appeared to create meaningful learning experiences that facilitated deeper cognitive engagement and contextual interpretation among students. The findings suggest that analytical reasoning develops more effectively when learners are exposed to socially relevant problems that mirror professional public health practice. Therefore, this study extends existing theoretical discussions by highlighting the importance of authentic and context-based learning environments in fostering analytical engagement, reflective thinking, and evidence-based reasoning within higher education settings.

The findings of this study have several practical implications for public health education, particularly in the design and implementation of contextual learning environments that support analytical competency development. The integration of authentic tuberculosis cases into Problem-Based Learning demonstrates the importance of utilizing real community health issues as learning resources in higher education. Public health educators may consider incorporating locally relevant health problems into classroom activities to encourage students to engage more critically with complex public health realities. Such approaches can create more meaningful learning experiences by enabling students to connect theoretical knowledge with practical situations encountered within their own communities. Furthermore, this study suggests that

curriculum developers and higher education institutions should strengthen the implementation of inquiry-based and reflective learning strategies within public health programs. Learning activities that emphasize collaborative discussion, contextual problem analysis, and reflective engagement may better prepare students for professional decision-making processes in public health practice. In addition, the use of authentic cases may help foster professional awareness, social responsibility, and evidence-based reasoning among students. Therefore, integrating authentic community-based learning experiences into public health curricula could become an important strategy for developing adaptive, analytical, and context-sensitive public health professionals capable of addressing contemporary community health challenges

CONCLUSION

This study explored students' analytical reasoning experiences during the implementation of authentic case-based Problem-Based Learning in tuberculosis education among public health students in Indonesia. The findings demonstrated that authentic tuberculosis cases encouraged students to engage actively in contextual analysis, evidence-based reasoning, collaborative inquiry, and reflective thinking processes. Through authentic learning experiences, students were able to connect theoretical public health concepts with real-world community health problems, thereby developing deeper analytical understanding and more meaningful learning engagement. The study also highlights the pedagogical importance of authentic Problem-Based Learning in strengthening competencies required in public health practice, particularly analytical reasoning, contextual problem-solving, and evidence-informed decision-making. These findings support constructivist and authentic learning perspectives, emphasizing that analytical competencies are more effectively developed through socially relevant and context-based learning environments.

Despite these contributions, this study has several limitations. The research was conducted within a single higher education context and involved a limited number of participants, which may affect the transferability of the findings to broader educational settings. In addition, the study focused specifically on tuberculosis education within a qualitative case study framework, leaving other public health issues and learning contexts insufficiently explored. Therefore, future studies are recommended to investigate the implementation of authentic case-based Problem-Based Learning across different institutions, public health topics, and educational environments, including digital and interdisciplinary learning settings. Further research employing mixed-method or longitudinal approaches may also provide deeper insights into the long-term development of analytical reasoning competencies among public health students.

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Authors' Contribution

Author 1 served as the corresponding author and was responsible for the overall conceptualization of the study, research supervision, and manuscript preparation. Author 2 contributed to the development of the research design, data analysis, and interpretation of findings. Author 3 participated in data collection, classroom observations, participant coordination, and documentation during the implementation of authentic case-based Problem-Based Learning activities. Author 4 contributed to manuscript revision, language refinement, and critical review of the final article. All authors collaboratively participated in conducting the research, discussing the findings, and approving the final version of the manuscript prior to submission.

Disclosure Statement

The authors declare that there are no conflicts of interest regarding the publication of this study.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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