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# Team-based learning in Indonesian midwifery education: Implementation research

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## Abstract

**Aim:** This study aims to implement team-based learning (TBL) and assess the impact on faculty members and students within midwifery education in Indonesia.

**Methods:** Proctor's Framework for Implementation Research serves as the guiding approach in investigating the role of implementation strategies in implementing TBL within the context of midwifery education. The RE-AIM (Reach, Efficacy, Adoption, Implementation, and Maintenance) framework was utilized to assess the outcome.

**Results:** In this study, the implementation of TBL has demonstrated significant reach, with broad participation among both faculty and students in two schools. The efficacy of TBL is evident through enhanced student knowledge, engagement and active learning. Adoption of TBL was observed in both schools, with faculty and students expressing interest and active participation. High levels of implementation fidelity were maintained, even though with challenges related to preparation and implementation. These findings suggest that TBL can be successfully integrated into midwifery education, with positive implications. Regarding maintenance, faculty members have expressed their intention to continue using TBL in various topics for future lectures.

**Conclusions:** The implementation of TBL in Indonesian midwifery education has shown substantial reach and efficacy. Faculty and students are highly interested in adopting TBL for future use. Despite some implementation challenges, the study suggests that TBL can be effectively incorporated with minor adjustments, emphasizing its feasibility and potential impact. This research contributes to understanding TBL's applicability in various educational settings, especially in low-resource institutions.

**KEYWORDS**
curriculum, education, midwifery, nursing, team-based learning

# 1 | INTRODUCTION

In primary health care, midwives have an important role in health promotion, prevention of disease and provide community care. in other words, midwives are an essential element in the achievement of universal health coverage (World Health Organization, 2022). In Indonesia, over 90% of antenatal care and 62.7% of deliveries are assisted by midwives. However, despite their important role, the expected quality of midwifery services

is not being met due to a lack of professional competencies among Indonesian midwives (Indrayani et al., 2017; World Health Organization, 2019; Yanti et al., 2015). Addressing this situation requires a focus on the education and training of midwifery students to produce competent graduates (Indrayani et al., 2017).

To ensure the delivery of high-quality care, midwives require an integration of extensive knowledge and interprofessional skills that enable them to possess professional clinical competencies. Transitioning to an education model that encourages active learning is necessary to promote students' analytical and critical thinking abilities. However, in Indonesia traditional passive learning methods are still predominantly used in midwifery education.

Several forms of active learning have been widely developed to explore students' learning potentials. Team-based learning (TBL) is one of the active learning methods which have been growing in natural and social science. Several studies have shown that TBL results in positive learning outcomes. Structured activities have been shown to improve student knowledge, analytical thinking, and clinical performance (Yeung et al., 2023: Ulfa et al., 2021a; Kim et al., 2016).

Moreover, TBL encourages students to engage in self-directed learning (Cheng, Liou, Tsai, & Chang, 2014) and improve their interpersonal skills, and confidence (Cheng, Liou, Tsai, & Chang, 2014; Considine et al., 2014; Currey et al., 2015). A systematic review of nursing and midwifery higher education found that the positive learning outcomes and learning behavior resulting from TBL are positively correlated with academic performance (Dearnley et al., 2018).

In addition to its impact on students, our study recognizes the pivotal role played by faculty members in the successful implementation of TBL in midwifery education. Faculty members are instrumental in designing TBL modules, facilitating classroom activities, and fostering a supportive learning environment (Burgess et al., 2020). However, the transition from traditional teaching methods to active learning approaches like TBL may present challenges and opportunities for educators. A previous study reported that in implementing TBL, faculties required greater preparation time than traditional lectures, and workload was noted as one of the challenges. It is essential to understand faculty members' perspectives, and readiness for this pedagogical shift (Kebodeaux et al., 2017).

In Indonesia, prior study on TBL has been conducted in midwifery education by Ulfa et al. (2020), resulting in positive outcomes in enhancing learning outcomes and experience. Therefore, we intend to expand the implementation of TBL in some midwifery schools in Indonesia. In this study, implementation research assesses whether TBL achieves its objectives. It involves the intricacies of the implementation process. The significance of our research lies in its focus on the practical aspects of introducing, implementing, and adopting TBL within Indonesian midwifery education.

## 2 | AIMS

This study aims to assess TBL implementation outcomes on faculty members and students in midwifery education in Indonesia.

## 3 | METHODS

### 3.1 | Study design

This study follows the Proctor's Framework for ImplementationResearch (Proctor et al., 2009). The Proctor's Framework is employed to understand the implementation strategies which guide the process of translating evidence-based interventions into educational practice. Implementation strategies encompass the methods and techniques employed to enhance adoption, implementation, and acceptability (Proctor et al., 2009) of TBL. These strategies involve a range of actions that support faculty members in the adoption and execution of TBL intervention. In terms of implementation outcomes, the study adopts the RE-AIM (Reach, Efficacy, Adoption, Implementation and Maintenance) framework to frame the evaluation of implementation outcomes (Glasgow et al., 1999). Table 1 describes the implementation strategies of the interventions of TBL (Proctor et al., 2009) and Table 2 presents the key components of implementation research (Proctor et al., 2012). We adhere to the Standards for Reporting Implementation Studies (StaRI) Statement in conducting and reporting this study (Pinnock et al., 2017).

### 3.2 | Setting

The schools were purposively selected, as the faculties at these schools had previously been invited to participate in a pilot study of e-learning using TBL. Additionally, the schools were chosen to represent different regions of Indonesia, with Health Polytechnic Kupang under the Ministry of Health (referred to as School A) in East Nusa Tenggara representing the eastern part of Indonesia, and Universitas Andalas (referred to as School B) in West Sumatra representing the western part of Indonesia. The research permit was sent to the selected institutions before conducting the study.

**TABLE 1** Implementation strategies, operational definitions, and program month (Proctor et al., 2009).

| Intervention strategies | Implementation strategies | Operational definitions | Month |
|---|---|---|---|
| Implementation of TBL (team-based learning) | Previous year program (done in 2021) | | |
| | Develop formal implementation blueprint[a] | This plan outlines the phases, key activities, roles and responsibilities, deliverables, and the anticipated timeline for introducing TBL as an active learning approach | July 2021 |
| | Develop academic partnerships[a] | The research team will partner with midwifery schools to facilitate implementation of TBL with existing curricula and academic goals of participating midwifery schools | August–October 2021 |
| | Develop educational materials[a] | The research team is developing educational resources, including video e-learning in English with a specific focus on enhancing faculty understanding of TBL and designing TBL sessions within the context of midwifery education | August–October 2021 |
| | Distribute educational materials[a] | The research team is disseminating the URL for the video e-learning modules to the faculty in the respective school settings | January–February 2022 |
| | At this protocol | | |
| | Change physical structure and equipment[a] | Modifying the physical aspects and resources used for educational purposes, specifically referring to the adaptation of the video e-learning materials from the English language to Bahasa Indonesia to better align with local language | May–June 2022 |
| | Conduct educational meetings[a] | Conduct in-person meetings with faculty members at the designated location to provide training on TBL preparation and implementation | October 2022 |
| | Facilitation[a] | Active engagement of the research team with faculty to provide guidance, support, and assistance in the successful planning and execution of TBL. This support includes regular communication, addressing queries, resolving challenges, and assisting in the effective implementation of TBL strategies, both in the online and offline contexts | October 2022 |
| | Assess for readiness and identify barriers and facilitators[a] | Comprehensive evaluation to assess the willingness and preparedness of faculty and students to adopt | October 2022 |

(Continues)

**TABLE 1** (Continued)

| Intervention strategies | Implementation strategies | Operational definitions | Month |
|---|---|---|---|
| | | TBL in the midwifery education context | |
| | Conduct local needs assessment[a] | The process of systematically gathering and analyzing information, opinions, and data relevant to the specific educational and organizational needs and challenges within the midwifery school setting, with a focus on how TBL can be effectively integrated to address these needs and challenges | October 2022 |
| | Promote adaptability[a] | The active encouragement and support provided to faculty members and students to tailor TBL to suit the specific needs and requirements of midwifery education, ensuring its compatibility and effectiveness within this context | November 2022–January 2023 |

[a]Refer to Powell et al. (2015).

## 3.3 | Sample

We calculated the sample size of the faculty based on the faculty members' participation in our previous pilot study of TBL e-learning (Shishido et al., 2022). Furthermore, the average number of faculty members in the midwifery school is around 15–20 people. Considering that this research is quite long and requires commitment from faculty members starting from e-learning, face-to-face training, designing TBL and its implementation, so we set 5–8 participating faculty members per school.

For student sampling, we used G power analysis (Faul et al., 2009) and set the effect size at 0.3 with a power of 80%. We used a bivariate correlation and set the alpha level at .05. We estimated a sample size of 84 students and accounted for a 10% dropout rate, resulting in a total sample size of 92 students.

The inclusion criteria, for faculty members:

1. hold a Master's degree or above
2. have teaching experience of at least 2 years
3. no previous experience of TBL implementation.

The inclusion criteria, for students:

1. midwifery student
2. no previous experience of TBL
3. completed previous semester credits/related topic which support the recent topic through TBL.

## 3.4 | Study period

This study was conducted from October 2022 to March 2023.

## 3.5 | Procedure for conducting the study

### 3.5.1 | Stage 1: Feasibility study of TBL e-learning (conducted in 2021)

We completed this feasibility study (IRB no. 21-A070). The researchers created two instructional videos about TBL and its implementation. After the videos were completed, midwifery faculty members in Indonesia who were able to communicate in English were invited to participate in the TBL e-learning and submit pre- and post-tests (as part of the feasibility study of e-learning) (Shishido et al., 2022).

### 3.5.2 | Stage 2: Expanding the introduction of TBL e-learning through Bahasa Indonesia to other faculties (in this protocol – Year 2022)

After the feasibility of TBL e-learning, one of the researchers (YU, who lives in Indonesia and holds a teaching and midwifery license) translated the e-learning video into Bahasa Indonesian. Subsequently, the researcher

**TABLE 2** Key components of an implementation study (Proctor et al., 2012).

| Study component | Definition |
| --- | --- |
| Research objective | To fill a gap in the implementation of evidence-based educational practices by introducing team-based learning (TBL) and assessing its impact on faculty members and students in midwifery schools in Indonesia |
| Evidence-based practice | The use of TBL as an educational strategy |
| Theoretical justification | Conceptual model: <br> constructivist learning theory. This theory explained that learning is an active, meaning-making process where students construct knowledge through engagement with their peers and with meaningful problems. TBL aligns with this theory by fostering collaborative learning, promoting critical thinking, and encouraging students to construct their understanding of course content through group interaction. <br> Variables and measurement: <br> We will measure the following key variables: knowledge outcomes and student engagement. <br> Analytical plan: <br> Our analytical plan will include quantitative and qualitative methods to analyze the data collected. We will use statistical analyses to evaluate the impact of TBL on knowledge outcomes and student engagement. Additionally, qualitative analyses of student and faculty feedback will provide deeper insights into the learning experience. |
| Stakeholder engagement | Stakeholder engagement in our study is a well-defined and iterative process that involves key actors from multiple levels within the educational institutions, including faculty members, students, and administrative staff |
| Implementation strategy | The plan and actions taken to ensure the effective adoption and execution of TBL as explained in Table 1 |
| Team expertise | Educational experts in TBL, quantitative researchers and qualitative researchers |
| Study design | Mixed method design |
| Measurement | Conceptual justification: <br> Our choice of measurement instruments is conceptually justified and aligns with the key concepts of TBL implementation and its expected outcomes. These measurements are guided by the theoretical foundation of the study, including constructivist learning theory. <br> Existing measurement instruments: <br> We have selected existing measurement instruments that have been validated and used in previous research. These instruments are widely recognized in the field of education and healthcare and have demonstrated reliability and validity. <br> Coverage of concepts: <br> The measurement instruments used in our study cover a range of concepts related to TBL implementation, including knowledge outcomes. To assess the impact of TBL on knowledge outcomes, student satisfaction, student-directed learning, and faculty understanding and intention to implement TBL |

distributed the research request and procedure, along with an informed consent and refusal form, to all faculties in the setting institutions. Once we received consent from the faculties, the researcher asked them to watch a TBL learning video before attending the face-to-face training.

### 3.5.3 | Stage 3: Face-to-face training for faculty members (in this protocol – year 2022)

After completing the e-learning session within the specified timeframe, one of the researchers, YU, conducted a 1-day, 6-hour face-to-face training session for the faculties. Face-to-face sessions are conducted to facilitate researchers, acting as a facilitator, providing direct guidance on how

faculty members prepare learning objectives to be achieved with TBL, creating scenarios for effective application exercises, and, notably, conducting simulations of TBL stage activities. Furthermore, at this stage, the researchers engaged in discussions regarding the adaptation of TBL to accommodate available resources, curriculum, facilities, and various contextual factors within the broader context of midwifery education in Indonesia.

### 3.5.4 | Stage 4: TBL preparation by faculties for students (in this protocol – year 2022)

After the training, the faculties prepared their topics to implement TBL in the classroom. They took 1–2 weeks

to design the iRAT (Individual Readiness Assurance Test), tRAT (Team Readiness Assurance Test), and application exercise based on their topics. This TBL process is presented in Appendix 1. Meanwhile, one of the researchers and a research assistant recruited student participants. The researchers provided research requests and procedure documents to students and posted announcements on the notice board.

### 3.5.5 | Stage 5: Implementation of TBL course (in this protocol – year 2022)

After preparing and designing the TBL teaching method, the faculties implemented it at least once for the students. One of the researchers attended the implementation session to ensure that all elements of TBL were achieved.

### 3.5.6 | Stage 6: Three months follow-up for faculties and students (in this protocol – year 2022)

After a period of 3 months following the implementation of TBL, we organized a focus group discussion (FGD) to inquire about the faculties' readiness to implement TBL for their upcoming class and to determine any obstacles they encountered while implementing the approach.

## 3.6 | Measures and data collection

The RE-AIM (Reach, Efficacy, Adoption, Implementation, and Maintenance) was used to evaluate the impact of the implementation outcomes (Glasgow et al., 1999) (Appendix 2).

## 3.7 | Instruments

### 3.7.1 | Attendance list

We used an attendance list to prove faculty attendance in e-learning and face-to-face training and student attendance in the TBL class. The cut-off for faculty members was set at five faculties per school, and for students, it was set at 46.

If more than five faculties per school participated in the e-learning and face-to-face training, it was considered a good outcome/reach and vice versa.

Similarly, if more than 46 students per school participated in TBL classes, it was considered a good outcome/reach and vice versa.

### 3.7.2 | Post-implementation questionnaires for faculties

The intention of implementing TBL was assessed using post-implementation questionnaires, which were self-report questionnaires designed to asked for faculty understanding and acceptance of TBL. The questionnaires were develop based on the feasibility item by Bowen (2009) consisted of 16 items, which participants rated using a four-point scale (1–4). The total score ranged from 16 to 64, with higher scores indicating a greater understanding and acceptance of TBL. A score of 32 was set as the cut-off value indicating the intention to implement TBL.

### 3.7.3 | Learning outcome (knowledge)

The student's knowledge was measured using pre- and a post-tests, which consisted of a multiple-choice questionnaire developed by the faculties based on the topic material. In School A, the TBL topics covered midwifery concepts. Faculty members prepared a pre-post-test consisting of 10 questions. At School B, the TBL focused on lactation management. The faculty members prepared and administered a pre-post-test with 15 questions. The total score for each test could range from 0 to 100, with a higher score indicating a better understanding of the material.

### 3.7.4 | TBL student assessment instrument

The TBL student assessment instrument (TBL-SAI), developed by Mennenga in 2012, evaluated students' perceptions and experiences regarding TBL. It is a self-report questionnaire with 33 items, organized into three subscales: accountability, preference, and student satisfaction. These items use a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The accountability subscale (items 1–8) assesses students' preparation and contributions to their team, with a score >24 indicating approval of TBL. The preference subscale (items 9–24) assesses learning preference, and a score >48 suggests a preference for TBL. The satisfaction subscale (items 25–33) measures student satisfaction, with a score >27 indicating higher satisfaction with TBL. Ten items are reverse scored (4, 11, 13, 14, 16, 18, 21, 22, 28, and 30), resulting in a total score range of 33–165. A higher score signifies a better TBL experience, with a cut-off value of 99.

Mennenga (2012) reported a Cronbach's alpha of .941 for the total scale. Branney and Priego-Hernández (2018) also used the TBL-SAI with second-year undergraduate nursing students in the UK and obtained an alpha of .88.

### 3.7.5 | Nursing student satisfaction

For measuring student satisfaction, we utilized the nursing student satisfaction questionnaire developed by Chen et al. (2012), specifically adopted for this study. The questionnaire consists of eight items that evaluate student satisfaction with teaching methods, and responses were measured on a five-point Likert-type scale. The total score ranges from 8 to 40, with a higher score indicating higher student satisfaction. A score of 24 was set as the cut-off value indicating satisfactory levels of student learning satisfaction. The curriculum scale of the questionnaire demonstrated high reliability, with a Cronbach's alpha coefficient of .91 (Chen & Lo, 2012).

### 3.7.6 | Self-directed learning instrument

The self-directed learning instrument (SDLI) is a self-report questionnaire consisting of 20 items categorized into four factors: learning motivation, planning, and implementing, self-monitoring, and interpersonal communication. Participants rated each item using a five-point Likert scale, with scores ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicate greater self-directed learning ability. A cut-off value of 60 was established. The total scale demonstrated high reliability, with a Cronbach's alpha coefficient of .92 (Cheng et al., 2010).

### 3.8 | Data analysis

The data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 22.0 for Windows. The pre- and post-tests of student knowledge were analyzed using Wilcoxon signed-rank test because the data were not normally distributed. Between-group comparisons of learning experience (TBL-SAI, nursing student satisfaction and self-directed learning [SDL]) were conducted using independent $t$-tests, and correlations between student knowledge score and SDL score were examined using Pearson correlation because the data are in a continuous scale. For the post-implementation faculty assessment, we conducted an analysis using the Mann–Whitney $U$ test. Statistical significance was determined at a $p$-value <.05. Thematic data analysis is used for qualitative data, such as free descriptions/comments and interviews.

### 3.9 | Ethics statement

The research was carried out following the principles outlined in the Declaration of Helsinki and received approval from the Ethics Committee of St. Luke's International University, Japan (no 22A-074) on November 24, 2022. Participants were guaranteed confidentiality and anonymity throughout the study and publication phases. Participants were informed about the study's objectives and methodology, and informed that their participation was voluntary.

## 4 | RESULTS

This research project started in 2021; we initiated a research project focused on developing e-learning materials on TBL. In 2022, as part of the study, we conducted face-to-face training sessions in a day (6 h) alongside the e-learning program. We invited faculty members from two midwifery institutions to participate in TBL implementation, and a total of 16 female faculty members, eight from each school, with a Master's degree and more than 5 years of teaching experience participated in this study. Regarding the students, in School A, first-year midwifery students ($n = 47$) and in School B, second-year midwifery students ($n = 74$) participated in TBL classes.

### 4.1 | Reach

Eight faculty members from each school participated in this study and all completed all these stages without dropping out. This means 100% of participants from each school attended the full of program. The program consisted of several stages, including e-learning on TBL, face-to-face TBL sharing sessions, designing TBL for students, and implementing TBL directly in the classroom.

This is further supported by a statement from the faculty members who expressed their interest in TBL as bellow:

> "Although we have already implemented problem-based learning, we were still interested in participating in the TBL learning design when we were invited to do so and we made time for it" (Faculty, School B)

According to the stages, the various faculty were asked to implement TBL. To facilitate this, we coordinated with them to implement TBL in one session at each school. The decided topic determined the eligibility of students invited to participate.

At School A, all grade 1 students (100%) participated in the TBL class for one session (2 h) focused on midwifery concepts. At School B, all grade 2 students (100%), participated in the TBL class on lactation management.

The number of faculty members and students participating in this TBL implementation was 100%; this demonstrates that it is both affordable and feasible.

## 4.2 | Efficacy

The efficacy of TBL implementation in midwifery education is evident from the positive impact. The faculty reported several benefits of implementing TBL, including achieving higher-level learning objectives, enhancing critical thinking, facilitating peer support, improving communication skills, and promoting SDL, as stated below:

> "I believe that students should not just memorize information but should also be able to apply what they have learned by solving case studies and completing application exercises. This approach helps them go beyond simple memorization to develop their analytical skills." (Faculty, School A)

> "Which is definitely more critical. Students must be able to study the cases given so that their understanding of the learning material will deepen." (Faculty, School A)

> "I also noticed mutual support during the discussion. Yesterday, one of the student was hesitant to speak, but the others encouraged them and offered to assist later." (Faculty, School B)

Regarding the students, we assessed the efficacy of TBL implementation by measuring learning outcomes such as knowledge (pre and post-test), TBL-SAI, nursing student satisfaction, and the SDLI after each class session.

Table 3 presents a comparison of the knowledge scores in School A. The pre-test median score was 50.0, while the post-test median score was 90.0 indicating a significant increase ($z = -6.2$, $p < .001$). Similarly, in school B, there was a significant increase ($z = -7.6$, $p < .001$) in the median knowledge scores between the pre-test (46.7) and the post-test (86.7). These findings indicate that the implementation of TBL effectively improves students' knowledge.

Furthermore, Table 4 presents the mean scores of the TBL-SAI, nursing student satisfaction, and SDL instrument after the class session. According to the TBL-SAI instrument, students in School A had a mean score of 121.3 (SD = 6.9), while in school B, it was 126.7 (SD = 10.6), indicating a positive learning experience with TBL. As well as nursing satisfaction and SDL. In School A the mean score of nursing satisfaction and SDL was 32.9 (SD = 3.7) and 75.6 (SD = 7.8) respectively. Meanwhile, in School B, the mean score of nursing satisfaction and SDL was 33.7 (SD = 2.5) and 76.8 (SD = 5.5), respectively.

Based on the $t$ test analysis, there is a significant difference between Schools A and B in terms of TBL-SAI

**TABLE 3** Comparison of knowledge scores between pre- and post-tests of students.

| Knowledge (0–100) | Pre-test | | Post-test | | $z$ | $p$-value |
|---|---|---|---|---|---|---|
| | Median | IQR | Median | IQR | | |
| School A ($n = 47$) | 50.0 | 40.0–50.0 | 90.0 | 80.0–90.0 | −6.2 | <.001 |
| School B ($n = 74$) | 46.7 | 40.0–53.4 | 86.7 | 80.0–93.4 | −7.6 | <.001 |

Note: $z$: Wilcoxon signed-rank test. IQR, interquartile range.

**TABLE 4** Mean score of team-based learning student assessment instrument (TBL-SAI), nursing student satisfaction and self-directed learning (SDL) instrument after student class session.

| Domain | School A ($n = 47$) | | School B ($n = 74$) | | $t$ test | $p$-value |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | | |
| 1. TBL-SAI (score 33–165) | 121.3 | 6.9 | 126.7 | 10.6 | −3.08 | <.001 |
| - Accountability subscale (score 8–40) | 32 | 2.9 | 32.1 | 3.6 | −0.18 | .86 |
| - Preference subscale (score 16–80) | 52.3 | 3.8 | 56.1 | 5.8 | −3.4 | <.001 |
| - Satisfaction subscale (score 9–45) | 37 | 3.4 | 38.5 | 4 | −2.1 | .04 |
| 2. Nursing satisfaction (score 8–40) | 32.9 | 3.7 | 33.7 | 2.5 | −2.97 | <.001 |
| 3. Self-directed learning score (score 20–100) | 75.6 | 7.8 | 76.8 | 5.5 | −1.01 | .32 |

Note: Likert scale (1; strongly disagree, 2; disagree, 3; neither agree nor disagree, 4; agree, 5; strongly agree).

(Preference Subscale, Satisfaction Subscale) and Nursing Satisfaction ($p < .05$). However, the overall scores indicate that both Schools A and B had a positive response to TBL.

We also analyzed the correlation between student mean knowledge score and SDL, which showed a moderate correlation between knowledge and SDL ($r = 0.60$, $p < .001$). This suggests that the higher is a student's SDL, the better is the knowledge score.

## 4.3 | Adoption

Faculty members implemented TBL directly with their students. At both institutions, all participating faculty members were able to collaborate in designing TBL classes, and two faculty members were able act as facilitators in TBL classes. Moreover, several faculties also designed their own TBL for other classes and topics.

Table 5 demonstrates that faculty members in both School A and School B effectively explained TBL and its design. The participants from both schools showed a high level of acceptance for TBL, with a median score of 16.5 in School A and School B. Three-dimensional (understanding of TBL and its design, acceptance of TBL) scores are almost the same scores. There is no significant difference in faculty understanding and acceptance of TBL between Schools A and B ($p > .05$).

Furthermore, this is supported by a faculty member's statement:

> "I will integrate TBL into the current learning block, but its implementation across all blocks requires coordination with director and preparation from all faculty members. However, I can personally implement TBL for the topics that I cover in my block. In fact, I have already implemented TBL to replace one of my discussion classes outside of this study." (Faculty, School B)

As for the student evaluation, Appendix 3 shows the TBL-SAI score of both schools. The mean score for the preference subscale in School A was 52.3 (SD = 3.8), while in School B it was 56.1 (SD = 5.8).

In addition, based on the students' responses on the free comment in the TBL-SAI questionnaires, there was satisfaction with TBL, as follows:

> "For me TBL method was interesting, enjoyable, and easy to comprehend with peers". (Student, School B)

The result showed that TBL can be adopted by faculties and students as a of student-centered learning method.

## 4.4 | Implementation

The fidelity to TBL implementation strategies was notably high, with the intended TBL approach closely followed during planning and execution.

However, the preparatory phase for TBL posed challenges related to resources, curriculum, facilities, such as faculty coordination due to time constraints, TBL facilitators in the classrooms being adjusted according to the available number of lecturers, manual iRAT examinations conducted in line with the existing facilities, cost and difficulty adapting to new strategies. And that has to be adjusted, like the design of application exercises was tailored to match the questions from the national competency exams.

The acceptance score for TBL among faculty members in schools A and B was high, with a median score of 16.5 for both schools (Table 5).

One faculty member also showed support by the following statement:

> "For me, TBL can be implemented on this campus. Although it requires some preparation time, it is not complicated. However, to ensure the success of TBL, faculties must devote significant time and effort to prepare TBL lectures and activity components. But it's worth it." (Faculty, School A)

**TABLE 5** Comparison of post-implementation score for faculties.

| Sub scale | School A (*n* = 8) | | School B (*n* = 8) | | *u* | *p*-value |
|---|---|---|---|---|---|---|
| | Median | IQR | Median | IQR | | |
| Understanding of team-based learning (TBL) (5–20) | 19.0 | 18.0–19.8 | 19.0 | 18.3–19.8 | 28.0 | .66 |
| Understanding on designing TBL (6–24) | 21.0 | 21.0–22.5 | 21.0 | 21.0–23.0 | 29.0 | .73 |
| Acceptance of TBL (5–20) | 16.5 | 15.3–17.8 | 16.5 | 15.3–17.8 | 31.0 | .91 |

*Note*: Likert scale (1; strongly disagree, 2; disagree, 3; agree, 4; strongly agree). *u*: Mann–Whitney *U* test; IQR, interquartile range.

However, challenges were encountered, including time constraints and the need for coordination among faculties, particularly during the preparation phase. Limited facilities and a high student-faculty ratio posed additional challenges, cost, difficulty adapting to new strategies, as did the design of implementation exercises. This is shown by the faculty statements below:

"Here, several adjustments need to be made. In terms of implementation, we tailor it to the number of available lecturers and our existing facilities. If a scanning machine is not available, the manual method can be used as long as it aligns with TBL rules. The same applies to topics that we consider more suitable for TBL." (Faculty, School B).

"I am thinking, what if we use iRAT not just for basic theoretical questions, but also add simple cases? This way, individual students can develop their understanding of theoretical concepts applied in case forms, rather than just working in groups. This could better prepare them for the competency exam, where all the questions are in case form". (Faculty, School A).

"It is a challenging situation, as many of our senior colleagues are hesitant and raise objections due to the increased workload." (Faculty, School A).

One faculty member mentioned costing of implementing TBL was needed as it required fees for maps and answer-sheet preparations compared to traditional lectures.

> "To implement TBL, we need to prepare various materials including questions paper, answer sheets, IFAT paper and folio folders. Institutional support may also be beneficial." (Faculty, school A)

## 4.5 | Maintenance

The research team assessed the sustainability of TBL implementation. This can be seen after conducting FGDs with the faculty, it was revealed that they plan to utilize TBL in several topics for future lectures as follows:

> "Yes, I plan to try this TBL method next semester because I am curious about its effectiveness. From what we have observed in class, this method is interesting and may increase students' engagement and participation in learning". (Faculty, School A)

As for the students, they preferred TBL for their upcoming classes and topics, shown through free comments in the TBL-SAI as follows:

"I would like to have TBL for next topic and classes" (Student, School A)

"I hope TBL can implement in one of learning method in our blocks" (Student, School B)

## 5 | DISCUSSION

This study found that TBL implementation can be successfully implemented within the context of midwifery education in Indonesia. The positive impact on faculty and student engagement, the effectiveness of implementation strategies, and the adaptability of TBL highlight its potential as an active learning approach.

## 5.1 | Reach, efficacy and adoption

The results showed that the involvement of faculty members and students at all stages of this TBL implementation demonstrates both affordability and feasibility. The FGD with faculty members further supports the affordability and feasibility of TBL. The statistically significant results in Table 3, reflecting knowledge scores, and Table 4, representing student learning experiences, further confirm the efficacy of TBL. Additionally, the adoption of TBL is showed from the TBL-SAI scores and is further emphasized by the insights gathered from faculty members during the FGD.

Branney and Priego-Hernández (2018) implemented TBL in a pathophysiology topic with 167 undergraduate nursing students in the United Kingdom, showing that most students preferred and were satisfied with TBL. Similarly, Burton et al. (2021) conducted TBL in the Professional Communication for Nurses course with 305 post-registration nursing students in Singapore, and found moderate levels of positive engagement, learning, and satisfaction. In addition, Ulfa et al. (2020) conducted a pilot study on 64 midwifery students in Indonesia to investigate the feasibility of TBL in the context of post-partum hemorrhage, reporting that TBL was an acceptable and effective teaching method which improved students' knowledge and experience.

Furthermore, our study revealed that both faculty and students were able to adopt TBL. The adoption of TBL by faculties may be influenced by the perceived benefits of this approach. Previous research has shown that faculty members who adopt TBL report increased satisfaction with their teaching practices, as well as improved student engagement and performance (Tweddell et al., 2016). Moreover, the modular design of TBL allows for flexibility

in implementation, making it appealing to faculty members with diverse teaching styles and preferences (Burgess et al., 2020).

TBL has consistently demonstrated positive learning outcomes across various educational settings, as reported by numerous studies indicating a positive correlation between TBL and improved learning outcomes (Ulfa et al., 2021a; Ulfa et al., 2021b; Yeung et al., 2023). In our study, we also found a moderate correlation between knowledge and SDL. These findings align with a meta-analysis conducted by Doo et al. (2023), which included 14 studies and reported a medium effect of SDL on student learning outcomes. SDL involves taking responsibility for one's own learning process, setting learning goals, and independently seeking and acquiring knowledge. Knowledge serves as the foundation for effectively engaging in SDL activities, as learners require a certain level of knowledge (Nazarianpirdosti et al., 2021).

## 5.2 | Implementation and maintenance

The successful implementation of TBL by faculty members in this study is evident from the results obtained. Various factors contribute to the effectiveness of TBL implementation, including faculty training and support, availability of resources, and student readiness and motivation (Burgess et al., 2020). In our study, we provided faculty training programs on TBL using both online and offline methods, resulting in positive outcomes. These findings are consistent with previous systematic reviews and meta-analyses that have highlighted the effectiveness of technology-based training approaches (Mulyadi et al., 2021; Rezayi et al., 2022).

Both Schools A and B had positive responses to the implementation of TBL. However, there is a statistically significant difference between the two schools in terms of the preference subscale, satisfaction subscale, and nursing satisfaction of the TBL-SAI. These differences may be influenced by the previous teaching methods employed by faculty members in each school and the specific learning topics covered. School A primarily used didactic lectures, while School B utilized a variety of teaching methods, including problem-based learning. As a result, students at School B may have had greater exposure to active learning approaches, resulting in higher levels of engagement and interaction within their teams.

Furthermore, the specific learning topics in each school may have influenced students' perceptions and satisfaction levels regarding TBL implementation. Previous research by Thompson et al. (2007) has explained the influence of the course topic on TBL implementation. Additionally, in their systematic review, Hong and Rajalingam (2020) reported that TBL is more commonly used in the pre-clinical curriculum. School A, with its emphasis on nursing/midwifery concepts, likely incorporated more theoretical and philosophical aspects into their TBL exercises. On the other hand, School B's focus on lactation management, a more clinically oriented subject, may have resulted in TBL application exercises that closely resembled real-life clinical scenarios. Students at School B may have found these exercises more applicable to their future clinical practice, leading to higher levels of satisfaction.

While the study experienced high fidelity in the execution of TBL, the preparatory phase emerged as a challenging aspect. Time constraints, faculty coordination, and the design of application exercises were identified as hurdles that may be faced in the broader implementation of TBL. These challenges highlight the need for careful planning and the allocation of resources to mitigate potential obstacles.

It is worth considering the costs associated with preparing equipment for TBL implementation. Unlike traditional lectures that do not require additional expenses, TBL implementation may involve an initial investment in materials such as paper, folders, boxes, and other basic supplies. However, once acquired, these materials can be reused in subsequent TBL sessions and classes, making it a cost-effective investment in the long run.

The maintenance of TBL implementation over time depends on factors such as ongoing faculty training and support, institutional support and resources, and alignment with the curriculum and learning objectives (Burgess et al., 2020; Thompson et al., 2007). It is important to note that the maintenance of TBL implementation may also be influenced by student outcomes and feedback. A study by Ulfa et al. (2021a, 2021b) found that TBL improved learning outcomes and student satisfaction among nursing/midwifery students in Indonesia. These findings suggest that TBL has the potential to be a sustainable and effective teaching method in nursing/midwifery education in Indonesia, provided that ongoing evaluation and feedback are incorporated into the implementation process.

## 5.3 | Strength and limitation

The strengths of this study are first, it followed the Proctor's Framework for Implementation Research, providing a systematic and rigorous methodology for conducting implementation studies. Second, the combination of qualitative and quantitative data allowed for a well-rounded understanding of the topic.

However, there are certain limitations to consider. First, the findings may have limited generalizability as

sample size is relatively small, as it involved only two schools. The findings may not be fully generalizable to all midwifery schools in Indonesia due to variations in resources, and teaching methods. Second, the study focused on the short-term implementation of TBL. A more extended study over multiple semesters or academic years might offer a broader perspective on the long-term effectiveness and sustainability of TBL in midwifery education.

To address these limitations, future research should focus on conducting long-term follow-up studies. Additionally, examining the long-term effects of TBL on student learning outcomes, faculty adoption, and institutional support would further enhance the understanding of the impact of TBL in the Indonesian context.

# 6 | CONCLUSION

Our findings indicate that the implementation of TBL in Indonesian midwifery education has shown substantial reach and efficacy. Faculty and students are highly interested in adopting TBL for future use. Despite some implementation challenges, the study suggests that TBL can be effectively incorporated with minor adjustments, emphasizing its feasibility and potential impact.

Our research has identified several obstacles that educators and institutions may face: time constraints, cost, difficulty adapting to new strategies. Overall, our research contributes to the growing body of knowledge on TBL's applicability and the challenges it presents in diverse educational settings, especially in low-resource institutions.

## AUTHOR CONTRIBUTIONS

Yunefit Ulfa contributed to the conception, design of the study, data collection, statistical analysis, drafted the manuscript and editing. Shigeko Horiuchi was involved in developing the overall concept of the study, funding acquisition, and writing-review and editing. Eri Shishido was involved in design of the study and supervision. Yukari Igarashi was involved in design of the study and supervision. All authors have read and approved the final manuscript.

## CONFLICT OF INTEREST STATEMENT
The authors declare they have no conflicts of interest regarding this study.

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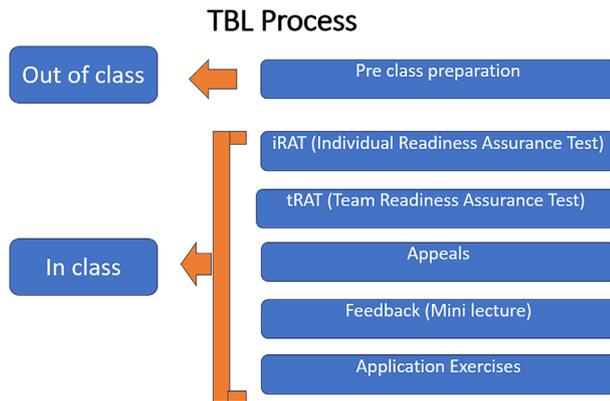*Eri Shishido* https://orcid.org/0000-0003-1519-2845

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# APPENDIX

## APPENDIX 1. THE TEAM-BASED LEARNING (TBL) PROCESS

### TBL Process



## APPENDIX 2. VARIABLE MEASUREMENT AND EVALUATION INSTRUMENT

| Variable | Definition | Instrument to evaluate | |
|---|---|---|---|
| | | **Faculty** | **Student** |
| Reach | The participant's interest to participate in the study | • Attendance list<br>• Focus group discussion (FGD) | Attendance list |
| Efficacy | The extent to which team-based learning (TBL) demonstrates its intended positive effects on student engagement, active learning, knowledge retention, and overall learning outcomes in midwifery education | • FGD | • Knowledge score<br>• TBL Student Assessment Instrument (TBL-SAI)<br>• Nursing student satisfaction<br>• Self-directed learning instrument (SDLI) |
| Adoption | The number of participants adopting the TBL learning method in the classroom | • Post-implementation questionnaires<br>• FGD | TBL-SAI |
| Implementation | To what extend was the intervention implemented as planned | • Post-implementation questionnaires<br>• FGD | • TBL process |
| Maintenance | The extent of the intervention applied as a routine teaching and learning method | FGD | TBL-SAI (free comments) |

## APPENDIX 3. DISTRIBUTION OF ANSWERS ON TEAM-BASED LEARNING STUDENT ASSESSMENT INSTRUMENT (TBL-SAI) BY STUDENTS

| No | Questionnaires | School A ($n = 47$) Mean (SD) | School B ($n = 74$) Mean (SD) |
|----|----------------|-------------------------------|-------------------------------|
| | Accountability subscale | | |
| 1 | I spend time studying before class in order to be more prepared | 4.0 (0.9) | 3.9 (0.7) |
| 2 | I feel I have to prepare for this class in order to do well | 4.3 (0.9) | 4.2 (0.6) |
| 3 | I contribute to my team members' learning | 4.1 (0.6) | 4.2 (0.5) |
| 4 | My contribution to the team is not important[®] | 4.0 (0.9) | 4.4 (0.7) |
| 5 | My team members expect me to assist them in their learning | 3.8 (0.8) | 3.6 (0.7) |
| 6 | I am accountable for my team's learning | 3.8 (0.7) | 3.9 (0.7) |
| 7 | I am proud of my ability to assist my team in their learning | 3.8 (0.7) | 3.8 (0.7) |
| 8 | I need to contribute to the team's learning | 4.1 (0.6) | 4.1 (0.5) |
| | Total | 32.0 (2.9) | 32.1 (3.6) |
| | Preference subscale | | |
| 9 | During traditional lectures, I often find myself thinking of non-related things. | 3.1 (1.0) | 2.8 (1.0) |
| 10 | I am easily distracted during traditional lectures | 3.0 (0.9) | 2.8 (0.9) |
| 11 | I am easily distracted during TBL activities[®] | 3.4 (0.8) | 3.5 (0.8) |
| 12 | I am more likely to fall asleep during lectures than during classes that use TBL activities. | 2.6 (0.9) | 2.6 (1.1) |
| 13 | I get bored during TBL activities[®] | 3.9 (0.8) | 4.1 (0.8) |
| 14 | I talk about non-related things during TBL activities[®] | 4.0 (0.6) | 3.9 (0.7) |
| 15 | I easily remember what I learn when working in a team | 3.5 (0.6) | 4.1 (0.7) |
| 16 | I remember material better when the instructor lectures about it[®] | 2.4 (0.8) | 2.8 (0.9) |
| 17 | TBL activities help me recall past information | 4.1 (0.5) | 4.2 (0.7) |
| 18 | It is easier to study for tests when the instructor has lectured over the material[®] | 2.5 (0.8) | 3.1 (0.9) |
| 19 | I remember information longer when I go over it with team members during the Individual Readiness Assurance Tests used in TBL | 3.8 (0.6) | 4.0 (0.7) |
| 20 | I remember material better after the application exercises used in TBL | 3.7 (0.7) | 4.2 (0.7) |
| 21 | I can easily remember material from lectures[®] | 2.5 (0.8) | 3.1 (0.9) |
| 22 | After working with my team members, I find it difficult to remember what we talked about during class[®] | 3.6 (0.8) | 4.0 (0.7) |
| 23 | I do better on exams when we used TBL to cover the material | 3.6 (0.7) | 3.9 (0.8) |
| 24 | After listening to lectures, I find it difficult to remember what the instructor talked about during class | 2.5 (0.7) | 2.9 (0.9) |
| | Total | 52.3 (3.8) | 56.1 (5.8) |
| | Student satisfaction subscale | | |
| 25 | I enjoy TBL activities | 4.1 (0.6) | 4.3 (0.6) |
| 26 | I learn better in a team setting | 3.9 (0.7) | 4.3 (0.6) |
| 27 | I think TBL activities are an effective approach to learning | 4.1 (0.7) | 4.3 (0.6) |
| 28 | I do not like to work in teams[®] | 4.2 (0.5) | 4.1 (0.9) |
| 29 | TBL activities are fun | 4.3 (0.7) | 4.4 (0.6) |
| 30 | TBL activities are a waste of time[®] | 4.4 (0.6) | 4.2 (0.8) |
| 31 | I think TBL helped me improve my grade | 3.9 (0.8) | 4.2 (0.6) |

(Continues)

| No | Questionnaires | School A (n = 47) Mean (SD) | School B (n = 74) Mean (SD) |
|---|---|---|---|
| 32 | I have a positive attitude toward TBL activities | 4.1 (0.5) | 4.3 (0.6) |
| 33 | I have had a good experience with TBL | 4.0 (0.7) | 4.3 (0.6) |
| | Total | 37.0 (3.4) | 38.5 (4.0) |
| | Total score | 121.3 (6.9) | 126.7 (10.6) |

*Note*: Likert scale (1; strongly disagree, 2; disagree, 3; neither agree nor disagree, 4; agree, 5; strongly agree).®Means the score of reverse items has been change.