

EFFECTIVENESS OF PEER-LED TEAM LEARNING IN IMPROVING 10TH GRADE STUDENTS' LEARNING OUTCOMES IN CHEMICAL REACTIONS

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ABSTRAK

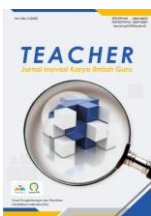
Artikel ini menganalisis efektivitas penerapan model pembelajaran kooperatif Peer-Led Team Learning (PLTL) dalam meningkatkan hasil pembelajaran siswa kelas 10 dalam topik reaksi kimia di sekolah menengah umum Dom Martinho da Costa Lopes, Balibo Five Branch, tahun ajaran 2026. Studi ini dikembangkan dengan 17 siswa dari kelas CT1 dan menggunakan lembar observasi, tes hasil pembelajaran (TRE), dan kuesioner sebagai instrumen. Analisis data dilakukan menggunakan teknik analisis deskriptif kuantitatif. Hasilnya menunjukkan tingkat kesepakatan yang tinggi dalam evaluasi instrumen, dengan $PA(01)=98,3\%$ dan $PA(02)=99,16\%$. Ada juga peningkatan antara momen evaluasi, dengan proporsi 0,38 pada T1 dan 0,93 pada T2. Dalam kuesioner, 88% siswa menyatakan sangat senang dan 12% puas dengan proses pengajaran dan pembelajaran, 71% memiliki pendapat sangat positif, 29% mendukung penggunaan PLTL dan 76% menunjukkan minat besar terhadap penerapan model tersebut. Mengenai penggunaan bahasa Portugis dan Tetum, 76% menganggapnya lebih mudah dipahami sementara 12% menyatakan pemahaman yang cukup, 6% mengalami kesulitan yang kecil dan 6% mengalami kesulitan tinggi untuk memahami. Hasilnya menunjukkan bahwa pelaksanaan PLTL dikaitkan dengan peningkatan hasil pembelajaran dan persepsi positif siswa terhadap proses pendidikan.

Kata kunci: pembelajaran kooperatif, Pembelajaran Tim yang dipimpin oleh sesama sebaya, hasil, pembelajaran reaksi kimia.

ABSTRACT

This article analyzes the effectiveness of the implementation of the Peer-Led Team Learning (PLTL) cooperative learning model in improving the learning outcomes of 10th grade students in the topic of chemical reactions at the Dom Martinho da Costa Lopes public general secondary school, Balibo Five Branch, 2026 school year. The study was developed with 17 students from class CT1 and used the observation sheet, the learning outcomes test (TRE) and the questionnaire as instruments. Data analysis was carried out using quantitative descriptive analysis techniques. The results showed high levels of agreement in the evaluation of the instruments, with $PA(01)=98.3\%$ and $PA(02)=99.16\%$. There was also an improvement between the evaluation moments, with a proportion of 0.38 in T1 and 0.93 in T2. In the questionnaire, 88% of the students declared to be very happy and 12% happy with the teaching and learning process, 71% had a very favorable opinion, 29% favorable to the use of the PLTL and 76% showed to be very interested in the implementation of the model. Regarding the use of the Portuguese and Tetum languages, 76% considered it easier to understand while 12% indicated sufficient understanding, 6% have little difficulty understanding and 6% have high difficulty understanding. The results indicate that the implementation of the PLTL was associated with improvements in learning outcomes and positive perceptions of the students about the educational process.

Keywords: cooperative learning, Peer-Led Team Learning, outcomes, learning chemical reactions.



INTROCUCTION

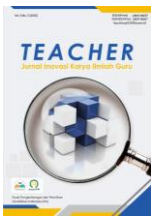
Education plays an important role in individual development and the social and national advancement of a country (Ahmed & Haji, 2022; Lewis, 2011). In Timor-Leste, education is constitutionally recognized as a fundamental right, with the state responsible for providing conditions that support access to education and training. Beyond access, the quality of teaching and learning is essential to developing students' knowledge, skills, and capacity to respond to the demands of contemporary society (Gafney, 2012; Young, Demirdögen, Bauer, & Lewis, 2025). This requires learning processes that encourage students to become actively involved in constructing and applying knowledge rather than merely receiving information from teachers (Bahar & Alwi, 2026; Young & Lewis, 2022).

In Natural Sciences education, particularly chemistry, appropriate instructional approaches are important because the subject involves abstract concepts related to the composition, structure, properties, and transformations of matter (Friskilia & Winata, 2018; Noryani, 2022). Chemical reactions are one of the fundamental topics that require students to understand relationships between concepts, interpret chemical phenomena, and apply principles to solve problems (Purnomo, 2021; Young & Lewis, 2022). Consequently, learning this topic requires more than memorization and should provide opportunities for students to discuss, reason, interpret information, and actively engage with learning activities (Putri & Lasmadasari, 2022; Wahyudinarti, Rachmatika, & Ain, 2025).

Cooperative learning provides an instructional approach that promotes interaction among students through structured group activities directed toward shared learning objectives. Through cooperation, students can exchange ideas, assume individual and group responsibilities, and participate more actively in the learning process (Hapili, Rachman, & Djaba, 2025; Saputra, Purwanto, Setiawan, Fernandez, & Putra, 2022). One model that incorporates these principles is Peer-Led Team Learning (PLTL), in which students work in small groups and are supported by a peer facilitator who guides discussion, encourages participation, and assists group members in working through learning activities (Adlakha, Shinde, & Varma-Nelson, 2026; Rosa & Lewis, 2020). This structure provides opportunities for students to learn from one another while strengthening their engagement with the subject matter (Ahmed & Haji, 2022; Waworuntu et al., 2024).

The need for an alternative learning approach was identified through six months of classroom observation at Dom Martinho da Costa Lopes Public General Secondary Education, Balibo Five Branch. The observation indicated that classroom instruction was predominantly teacher-centered, with the teacher frequently serving as the main transmitter of content, while students tended to participate less actively in learning activities. This condition indicates a need for instructional practices that provide greater opportunities for interaction, collaboration, and student participation (Astuti & Meilinda, 2024; Fanfiana & Hadisaputra, 2024). The implementation of PLTL was therefore considered as a strategy for creating a more participatory learning environment in the teaching of chemical reactions.

Although cooperative learning has been widely used to promote student participation and collaborative learning, the implementation of a peer-led structure in the teaching of chemical reactions among Grade 10 students in the Timor-Leste secondary-school context requires further examination. In particular, empirical evidence regarding the effectiveness of PLTL in this specific educational setting remains limited. Addressing this context is important because the effectiveness of an instructional model may depend on students' learning



characteristics, classroom conditions, and the way the model is implemented (Wilson & Varma-Nelson, 2021).

Based on this background, this study investigates the effectiveness of implementing the Peer-Led Team Learning model in improving the learning outcomes of Grade 10 students on the topic of chemical reactions at Dom Martinho da Costa Lopes Public General Secondary Education, Balibo Five Branch, during the 2026 school year. The study focuses on changes in students' learning outcomes following the implementation of PLTL and provides empirical evidence regarding its use as a cooperative learning approach in chemistry instruction.

METHODS

This study employed a quantitative descriptive design to examine the implementation of the Peer-Led Team Learning (PLTL) model and its effectiveness in improving students' learning outcomes in chemical reactions. The research was conducted at Dom Martinho da Costa Lopes Public General Secondary Education, Balibo Five Branch, located in the Administrative Post of Balibo, Municipality of Bobonaro, Timor-Leste. Data collection was conducted from August 24 to 27, 2026, during the third academic term. The participants were 17 Grade 10 students enrolled in the Science and Technology Course (CT1). The entire class was involved in the study using a total sampling approach. The participants consisted of 10 students (58.8%) and 7 students (41.2%). [Specify the category represented by these two groups, if applicable.

Three instruments were used for data collection: an observation sheet, a learning outcomes test, and a questionnaire. The observation sheet was used to record students' participation, interaction, collaboration, and behavior during the implementation of PLTL. The learning outcomes test was used to assess students' knowledge and understanding of chemical reactions, while the questionnaire was administered to obtain information about students' perceptions, opinions, experiences, and attitudes toward the learning process and the implementation of the PLTL model.

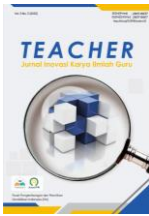
The data were analyzed using quantitative descriptive techniques. The percentage of agreement between observers was used to assess the consistency of the observation results, with a coefficient of 0.65 or higher used as the reference for acceptable agreement. Students' learning outcomes were analyzed based on the proportion of correct answers on the learning outcomes test, with a value of 0.65 or higher used as the reference criterion for satisfactory achievement. Questionnaire responses were analyzed descriptively to identify students' perceptions, experiences, and attitudes toward the implementation of the PLTL model.

RESULT AND DISCUSSION

Result

Observation Instrument Agreement

The results of the observation instrument showed a high level of agreement between the observers. The Percentage Agreement (PA) values were 98.3% for PA (01) and 99.16% for PA (02). Both values exceeded the reference criterion of 0.65 established in the study, indicating a high level of consistency between observers in recording students' participation, interaction, collaboration, and classroom behavior during the implementation of the Peer-Led Team Learning (PLTL) model.



Students' Learning Outcomes

Students' learning outcomes showed an increase between the two assessment moments. The proportion of correct responses in T1 was 0.38, while the proportion in T2 increased to 0.93. The difference between the two assessment results was 0.55, indicating a substantial increase in the proportion of correct responses after the learning process using the PLTL model.

Table 1. Students' Learning Outcomes Based on Assessment Results

Table 1. Assessment	Proportion of Correct Responses
T1	0.38
T2	0.93
Increase	0.55

Students' Perceptions of PLTL

The questionnaire results indicated positive student perceptions of the implementation of PLTL. Regarding the learning process using the PLTL model, 88% of students reported being very happy and 12% reported being happy. Regarding their opinions about the use of PLTL, 71% reported being very happy and 29% reported being happy. In terms of interest in the implementation of the model, 76% of students reported being very interested and 24% reported being interested.

Students' Perceptions of Language and Understanding

The responses concerning the use of Portuguese and Tetum indicated that most students perceived the use of these languages as supportive of their understanding. A total of 76% of students reported that the use of Portuguese and Tetum made the learning material easier to understand, 12% reported sufficient comprehension, 6% reported difficulty, and 6% reported great difficulty. Regarding learning through PLTL, 71% of students considered the approach easier to understand, 12% reported sufficient comprehension, 12% reported some difficulty, and 6% reported considerable difficulty in understanding.

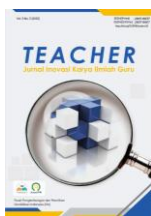
Discussion

Observation Instrument Agreement

The high Percentage Agreement values indicate that the observations of students' classroom activities were highly consistent between observers. The values of 98.3% and 99.16% were substantially above the study criterion of 0.65, suggesting that the observation data provided a consistent description of student participation and interaction during the implementation of PLTL. This consistency is important because cooperative learning involves observable behaviors such as participation, communication, collaboration, and engagement in group activities.

Improvement in Students' Learning Outcomes

The increase in the proportion of correct responses from 0.38 in T1 to 0.93 in T2 indicates an improvement in students' achievement following the implementation of the learning process using PLTL. The increase of 0.55 suggests that students demonstrated substantially better performance in the second assessment. This finding is consistent with the principles of cooperative learning, in which students actively participate in discussions,



exchange ideas, and work together to solve learning tasks. Within the PLTL structure, peer leaders can facilitate group discussions and encourage students to explain and clarify their understanding of chemical reaction concepts.

The observed improvement may also be related to the opportunities for students to learn from their peers. Peer interaction allows students to discuss concepts using language that may be more accessible to their classmates and to receive immediate clarification during group activities. Such interaction can support students in identifying misunderstandings and developing a better understanding of the learning material. However, because this study used a single class without a control group and relied primarily on descriptive analysis, the increase cannot be attributed exclusively to PLTL. The finding should therefore be interpreted as an observed improvement following the implementation of the learning approach rather than definitive evidence of a causal effect.

Students' Perceptions of PLTL

The questionnaire findings demonstrate generally favorable perceptions of PLTL. The fact that all students reported being either very happy or happy with the learning process, while 100% also reported being either very happy or happy with the use of PLTL, indicates that the model was positively received by the participating students. Similarly, all students expressed either very high or high interest in the implementation of the model. These responses suggest that the peer-led group structure provided a learning environment that students found engaging.

The positive perception can be understood from the characteristics of PLTL, which emphasizes small-group interaction and peer-supported learning. Students have opportunities to participate in discussions, exchange explanations, and work collaboratively rather than relying entirely on teacher explanations. Such activities may increase students' involvement and provide opportunities for them to take greater responsibility for their learning. Nevertheless, positive perceptions should be interpreted as evidence of students' experiences and attitudes rather than as direct evidence of improved academic performance.

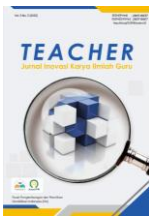
Language Use and Students' Understanding

The responses regarding Portuguese and Tetum indicate that language use was an important contextual factor in the learning process. Most students reported that the use of these languages facilitated their understanding, while a smaller proportion experienced varying degrees of difficulty (Sari et al., 2023). This finding suggests that communication strategies adapted to students' linguistic context may support their participation in learning activities.

The finding is particularly relevant to chemistry learning because students need to understand scientific terminology and communicate their reasoning when discussing chemical reactions. The peer-led structure may provide additional opportunities for students to clarify concepts through interaction with classmates using familiar forms of communication. Therefore, the combination of peer interaction and appropriate language use may have supported students' comprehension during the learning process.

Study Limitations

The findings should be interpreted in light of several limitations. The study involved only 17 Grade 10 students from a single class and was conducted over a period of four days. The study also did not include a control group or a comparison class, limiting the extent to which changes in learning outcomes can be attributed specifically to PLTL. In addition, the



descriptive nature of the analysis limits the ability to establish statistical causality. Therefore, the findings primarily describe the implementation and observed outcomes of PLTL in the participating class and should not be generalized automatically to other secondary schools or students in Timor-Leste.

CONCLUSION

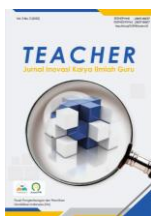
The implementation of the Peer-Led Team Learning (PLTL) cooperative learning model was associated with an improvement in the learning outcomes of Grade 10 students on the topic of chemical reactions at Dom Martinho da Costa Lopes Public General Secondary Education, Balibo Five Branch, in 2026. The proportion of correct responses increased from 0.38 in T1 to 0.93 in T2, indicating a substantial improvement in students' performance following the implementation of the learning process. However, this finding should be interpreted within the specific classroom context because the study did not include a control group.

The study also found generally positive student perceptions of the PLTL learning process. Students reported positive responses regarding the implementation of PLTL, their interest in the learning activities, and the use of Portuguese and Tetum to support their understanding. These findings indicate that peer-supported cooperative learning provided opportunities for student participation, interaction, communication, and engagement with chemistry content.

Further research is recommended to examine the implementation of PLTL over longer periods and with larger and more diverse groups of students. Future studies may also involve comparison or control groups and apply inferential statistical analyses to provide stronger evidence regarding changes in learning outcomes and the contribution of PLTL to chemistry learning.

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