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The Implementation of the STAD Model Assisted by Teaching Aids to Improve Student Learning Outcomes on the Respiratory System in Grade VIII of SMP Kartika IV-6 Ambulu

Zilfin Nabila[1], H. B. A Jayawardana[2], Dwi Sucianingtyas Sukamto[3]
[1,2,3]Pendidikan Biologi, Universitas PGRI Argopuro Jember, Indonesia

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ABSTRACT
This study aimed to improve the learning outcomes of Grade VIII students at SMP Kartika IV-6 Ambulu on the topic of the human respiratory system through the implementation of the Student Teams Achievement Division (STAD) cooperative learning model assisted by teaching aids. The study used the Classroom Action Research (CAR) method with the Kemmis and McTaggart design, conducted in two cycles consisting of planning, implementation, observation, and reflection. The subjects were 18 students, and data were collected using a validated multiple-choice test. The results showed an increase in the average score from 73.67 in Cycle I to 83.67 in Cycle II, while classical learning mastery improved from 66.67% to 100%. These findings indicate that the STAD model assisted by teaching aids is effective in improving students' cognitive learning outcomes and active participation in science learning.

Corresponding Author:
Zilfin Nabila,
Biology Education, Universitas PGRI Argopuro Jember
Jalan Jawa 10, Tegal Boto Lor, Sumbersari, Jember 68121, Indonesia
Email: nabilazilfin674@gmail.com

1. INTRODUCTION

Education plays a crucial role in shaping individuals of high quality, both intellectually and morally. Individuals can attain a good education through their process of learning (Sari, 2023). Learning is an activity that must be carried out by humans in their daily lives. Through learning, people can develop their potential so it can grow and be used to meet their needs of life (Nabila, 2024).

Education can be considered successful when the predetermined goals are achieved, as indicated by satisfactory learning outcomes. Learning outcomes are the output of the learning process used to assess whether an educational program has been successful or not (Fatimah, 2023). Therefore, to achieve optimal learning outcomes, careful lesson planning, effective teaching methods, and active student participation are required. In addition, comprehensive evaluation of learning outcomes is also essential to measure competency achievement and provide useful feedback for improving the quality of the learning process in the future (Artama et al., 2024).

Science is a subject that explores natural phenomena and scientific principles, encompassing aspects of physics, chemistry, biology, and earth science (Novianti, 2022). In their biology curriculum, several topics are taught in Grade VIII, one of which is the human respiratory system. Their learning of this material emphasizes providing direct experiences to students in order to understand the structure and function of the respiratory organs. Therefore, teachers are encouraged to develop effective teaching strategies, enhance students' learning motivation, and promote active participation in the learning process.

Their learning model is an essential component in addition to their teacher's role in the teaching and learning process (Hasriadi, 2022). The selection of an appropriate model greatly influences learning success, as each model has a different approach to delivering material. As stated by Kusmiyati (Sari, 2023), their learning model holds a crucial position in presenting instructional content, since an inappropriate choice of model may hinder teachers from achieving learning objectives. Therefore, a deep understanding of both learning models and media is necessary so that educators can adapt their methods to the characteristics of students, the material, and

the learning goals. The combination of these elements can enhance effectiveness, improve students' understanding, and create more engaging and higher-quality learning experiences.

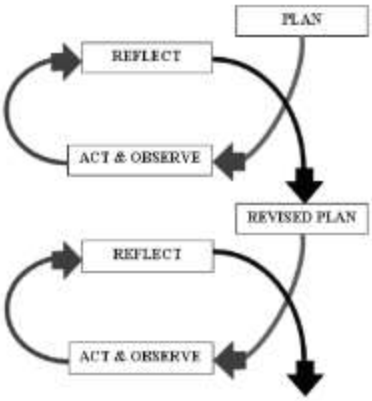
Based on their initial observations in Grade VIII of SMP Kartika IV-6 Ambulu, it was found that students' learning outcomes on the topic of the human respiratory system were still relatively low. This was evident from their low average student scores and their lack of active participation in their learning process. One of the main causes of this issue was the continued use of conventional, teacher - cantered learning methods, where students merely received information without actively engaging in the construction of their understanding.

To address these issues, a creative and innovative learning approach is needed to create a comfortable learning environment and to promote understanding and mastery of science material through active and collaborative student engagement. One learning model considered effective in improving student achievement and participation is the cooperative learning model Student Teams Achievement Division (STAD) (Sholikha & Alwin, 2023). This model emphasizes teamwork within heterogeneous groups, where students help each other in understanding their learning material (Hasanah & Himami, 2021).

Teaching aids are tools or objects used to help explain learning materials (Wattimury et al., 2023). They serve to stimulate the cognitive, affective, and psychomotor aspects of students, making the learning process more engaging and interactive (Hindayani, 2025). Teaching aids made from recycled materials, particularly those that resemble the organs and mechanisms of the respiratory system, are chosen because they are easy to create, cost-effective, and allow for active student involvement while fostering environmental awareness. Moreover, their use of teaching aids as visual media can enhance their understanding of abstract concepts by making them more concrete and easier to comprehend (Venty, 2023). This study aims to determine the extent to which student learning outcomes can be improved through the implementation of the STAD model assisted by teaching aids on the topic of the human respiratory system for Grade VIII students at SMP Kartika IV-6 Ambulu.

2. RESEARCH METHOD

This study employed a Classroom Action Research (CAR) method using the Kemmis and McTaggart model design, implemented through the application of the cooperative learning model STAD with the assistance of teaching aids to improve students' learning outcomes on the topic of the human respiratory system. Their research was conducted in two cycles, each consisting of four stages: (1) Planning, which involved developing learning tools validated by experts; (2) Implementation, referring to classroom learning activities using the cooperative STAD model supported by teaching aids; (3) Observation, which involved monitoring the activities of teachers and students during the learning process to assess students' level of engagement; and (4) Reflection, conducted to evaluate learning outcomes and determine the necessary improvements for the next cycle. The implementation flow of their action is illustrated in Figure 1.



Figur 1. Classroom Action Research Cycle of the Kemmis & McTaggart Model (Purba *et.al*, 2021)

The subjects of this study were eighth-grade students of SMP Kartika IV-6, located at SMP Kartika IV-6 Ambulu, Jln. Suyitman No.125 Rt/Rw 01/027, Ambulu Village, Ambulu Sub-district, Jember Regency. Their class consisted of 18 students, including 10 female and 8 male students. The students' learning outcome data were collected using a test instrument in the form of pre-test and post-test questions, consisting of 25 multiple-choice items. Their test was developed based on their learning objectives and had undergone content validation by educational experts. Therefore, the quality of the test as a tool to measure students' learning outcomes can be considered good. To determine the success of the actions implemented in this study, a success indicator was established. The success indicator in this research is their achievement of 85% classical learning mastery., calculated using the following formula. (Nurjannah, 2022).

$$\mathbf{KB = \frac{Nt}{T} \times 100\%}$$

Explanation:
KB = Learning mastery
Nt = Number of students who achieved mastery
T = Total number of students

This indicator is based on the Minimum Mastery Criteria (MMC) set for the science subject for eighth-grade students at SMP Kartika IV-6 Ambulu, which is 75.

3. RESULT AND DISCUSSION

Pre-cycle

The pre-cycle stage was the initial phase before implementing the cooperative learning model of the STAD type supported by teaching aids in the learning process. At this stage, the teacher still used a conventional approach in the form of a lecture and question-and-answer method, which was one-way, with the teacher acting as the main source of information while students served merely as passive recipients of the material. Their lack of interaction and student engagement in their learning process led to low participation in discussions and classroom activities. Moreover, most students faced difficulties in understanding abstract concepts in the topic of the human respiratory system, such as the breathing mechanism and the functions of respiratory organs. These challenges directly affected students' learning outcomes. Based on their initial evaluation (pre-test), it was found that the majority of students had not yet met the Minimum Mastery Criteria (MMC) set by the school, which was 75. This highlights the need for implementing a more interactive learning strategy that actively involves students to improve their understanding and learning outcomes.

The following is their pre-cycle learning outcome database based on the results of their daily assessment conducted before the implementation of the STAD learning model using teaching aids.

Table 1. Students' their pre-cycle stage. in the Pre-Cycle Stage

Explanation	Pre-Cycle Scores
Highest Score	75
Lowest Score	10
Average Score	40
Number of Students Achieving Mastery	3
Number of Students Not Achieving Mastery	15
Classical Learning Mastery (%)	16,67

Based on Table 1, the students' learning outcomes in the pre-cycle stage indicate that the conventional teaching method used was not effective in optimally enhancing students' understanding of the human respiratory system material. This is evident from their highest score, which only reached 75 the exact threshold of their Minimum Mastery Criteria (MMC) while their lowest score was 10. The average score of 40 reflects that the majority of students had not grasped the material well. Out of 18 students, only 3 achieved masteries, while the remaining 15 did not. Their classical learning mastery percentage was only 16.67%, which falls significantly below their minimum standard of 85% used as their benchmark for classical success. The low average score, their high number of students who did not reach mastery, and their lack of active participation in the learning process all highlight their need for a change in teaching strategy specifically, toward a more interactive approach such as the implementation of the STAD cooperative learning model supported by teaching aids.

Cycle I

The learning outcome data obtained during the implementation of Cycle I using the Cooperative Learning Model of the STAD (Student Team Achievement Division) type supported by teaching aids are as follows:

Table 2. Students' Learning Outcomes in Cycle I

Explanation	Cycle I Scores
Highest Score	92
Lowest Score	60
Average Score	73,67
Number of Students Achieving Mastery	12
Number of Students Not Achieving Mastery	6
Classical Learning Mastery (%)	66,67

In Table 2, the data show students' learning outcomes after the implementation of the STAD (Student Team Achievement Division) cooperative learning model supported by teaching aids. The evaluation results indicate that the highest score achieved by students was 92, while the lowest was 60. Their class average score was 73.67, which is still below their Minimum Mastery Criteria (MMC) of 75. Out of 18 students, 12 students (66.67%) achieved mastery by scoring at or above their MMC, while 6 students (33.33%) did not meet the required standard. Based on these results, the classical learning mastery in Cycle I has not yet met the success indicator set for the study, which is 85%. Their findings from Cycle I reveal a noticeable gap in student achievement. This gap is attributed to the lack of active participation from some students during group discussions and a high level of dependence on other group members, leading to suboptimal learning outcomes. Therefore, the researcher needs to proceed to the next cycle by conducting reflection and improving the learning process to enhance students' academic performance more effectively.

Cycle II

In Cycle II, after making improvements to their learning process through their implementation of the STAD (Student Team Achievement Division) Cooperative Learning Model supported by teaching aids, there was a significant improvement in students' learning outcomes compared to Cycle I, as shown in the following table.

Table 3. Students' Learning Outcomes in Cycle II

Explanation	Score of Cycle II
Highest Score	96
Lowest Score	76
Average Score	83,67
Number of Students Achieving Mastery	18
Number of Students Not Achieving Mastery	0
Classical Learning Mastery (%)	100

In Table 3, it can be seen that the highest score obtained by students increased from 92 in Cycle I to 96 in Cycle II. Similarly, their lowest scores also improved from 60 to 76, indicating that no students scored below their minimum standard. Their class average also experienced a significant increase, from 73.67 in Cycle I to 83.67 in Cycle II. The improvement in learning outcomes during Cycle II was due to students becoming more familiar with the steps of the cooperative learning model type STAD, allowing them to engage more effectively in the learning process. In addition, students' ability to adapt to their group members contributed to creating a more conducive learning environment. Students who were previously in the early stages of learning readiness began to show independence in conducting group discussions without requiring intensive supervision from their teacher, as was necessary in the previous cycle. Classical learning mastery showed a very positive change. In Cycle I, only 12 out of 18 students, or 66.67%, achieved mastery (scores ≥ the minimum mastery criteria of 75). However, in Cycle II, all 18 students, or 100%, achieved mastery. This means that the success indicator of their study, at least 85% classical learning mastery, was met, indicating that their study was successful.

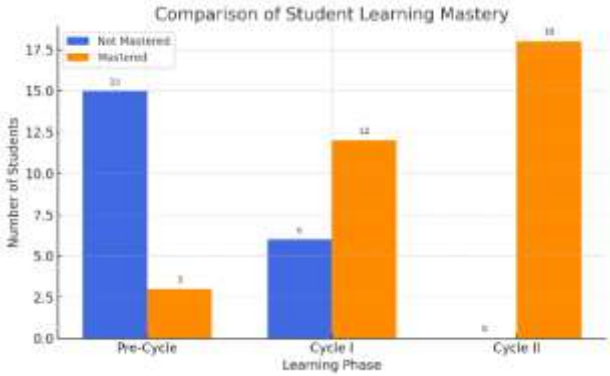
This improvement occurred because students had become accustomed to using their student worksheet provided by their teacher and had begun to establish effective collaboration with their group members. The increase in overall learning outcomes indicates that the implementation of the STAD cooperative learning model supported by teaching aids made a positive contribution to enhancing students' cognitive learning achievement. This finding aligns with the constructivist learning theory, which emphasizes that knowledge is actively constructed by learners through meaningful experiences and social interactions (Rizki et al., 2025). The group work structure within their STAD model encourages students to build their understanding collaboratively, which not only supports cognitive learning outcomes but also develops communication and teamwork skills (Amrulloh et al., 2025). Similar results were reported by Hasanah & Himami (2021), who found that their STAD model significantly increased student participation and engagement during classroom learning. Likewise, Rando (2021) affirmed that cooperative learning fosters essential social skills, while Simamora et al. (2024) highlighted that the STAD model strengthens students' conceptual understanding and learning motivation. Therefore, the implementation of the STAD model assisted by teaching aids in this study is consistent with previous research findings and has been proven effective in improving learning outcomes through an active, collaborative, and constructivist-oriented approach.

Based on observations conducted during their classroom action research, a side effect was also found in the form of increased student engagement. Students who tended to be passive in Cycle I began to show more active involvement in learning activities in Cycle II. This was evident from their growing willingness to ask questions about topics they had not yet understood and their increased participation in group discussions. As stated by Simamora et al. (2024), the STAD model is one of the simplest cooperative learning models, emphasizing the importance of student activity and interaction to motivate and help one another in understanding the lesson material. The main focus of STAD lies in student-to-student interaction and activity, aiming to create a supportive learning environment. In this context, students are encouraged to motivate each other and assist in comprehending

the material being taught. In this way, STAD not only enhances students' academic understanding but also builds essential social skills, such as teamwork and communication (Rando, 2021).

Their use of teaching aids aligns with modern learning approaches that avoid passive teaching methods and place greater emphasis on individualized learning, small-group collaboration, active engagement, and heuristic processes (Gusteti, 2024). Several experts refer to teaching aids as " teaching materials" or "instructional materials," which stem from the term *peraga* (demonstration), derived from the word *raga*, meaning something that can be , seen, heard, and observed through the five senses. Essentially, teaching aids are considered part of learning media (Rahayu, 2024). Teaching aids are a type of media categorized based on their physical form. Furthermore, they belong to the category of three-dimensional learning media that can be seen, touched, and manipulated (Murni, 2021). Thus, it can be concluded that teaching aids are tools used in the learning process to help teachers stimulate students' learning activities, thereby making it easier for them to understand the lesson material.

The improvement in students' learning outcomes in science subjects, based on mastery levels from their pre-cycle, Cycle I, and Cycle II, is presented in detail through the following diagram.



The bar chart illustrates the progression of student learning mastery across the pre-cycle, Cycle I, and Cycle II stages. In the pre-cycle phase, only 3 students achieved mastery, while the remaining 15 did not. This reflects students' low understanding of their material when conventional, one-way teaching methods were still being used. Following their implementation of their STAD cooperative learning model supported by teaching aids in Cycle I, there was a significant improvement: the number of students who mastered the material increased to 12, while those who had not mastered it decreased to 6. This improvement indicates that the more interactive learning strategy began to positively impact students' comprehension. In Cycle II, the learning outcome reached an optimal level, with all 18 students achieving mastery and none falling below their standard. This confirms that the application of their STAD model with the aid of teaching tools is more effective in improving students' understanding, participation, and overall academic performance.

However, this study also has several limitations. Their research was conducted only in one class with a total of 18 students, so their findings cannot be generalized to a wider population. In addition, their use of teaching aids required extra preparation time for their teacher, which may not be practical in schools with limited resources. Future studies are suggested to apply this model in different contexts with larger samples and to investigate its long-term impact on students' motivation and achievement.

4. CONCLUSION

The implementation of their STAD (Student Teams Achievement Divisions) cooperative learning model supported by teaching aids has proven effective in improving the learning outcomes of Grade VIII students at SMP Kartika IV-6 Ambulu in the topic of the human respiratory system. This is evidenced by the increase in students' average scores, from 40 in the pre-cycle stage to 73.67 in Cycle I, and further rising to 83.67 in Cycle II. Classical learning mastery also showed a significant improvement, from 16.67% in their pre-cycle to 66.67% in Cycle I, and reaching 100% in Cycle II. In addition to enhancing cognitive outcomes, this model also fostered active participation and student engagement through effective group discussions. Therefore, the STAD model supported by teaching aids can be considered an alternative instructional strategy that effectively enhances conceptual understanding and active student involvement in science learning, particularly in biology topics.

In addition to improving cognitive learning outcomes, this study contributes to the development of science learning approaches in junior high schools by demonstrating the effectiveness of environmentally friendly and interactive teaching aids. The use of recycled and low-cost materials as teaching aids not only enhances students' conceptual understanding of the human respiratory system but also fosters environmental awareness and active participation. Thus, this research provides a practical reference for integrating sustainable, interactive media into science learning to create more engaging and responsible educational practices.

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6. REFERENCES

Amrulloh, M. S., Kurniawan, K., & Sajjad, A. M. (2025). Implementasi Model Kooperatif STAD dalam Pembelajaran IPS. *Dirasah: Jurnal Studi Ilmu dan Manajemen Pendidikan Islam*, *8*(2), 676-688.

Artama, S., Djollong, A. F., Ismail, I., Lubis, L. H., Kalbi, K., Yulianti, R., ... & Diana, P. Z. (2024). Evaluasi hasil belajar. *Penerbit Mifandi Mandiri Digital*, *1*(01).

Fatimah, F. (2023). Studi Komparatif Hasil Belajar IPA Siswa Kelas VIII pada Materi Sistem Pencernaan dengan Uji Kruskal-Wallis. *BIO-CONS: Jurnal Biologi dan Konservasi*, *5*(1), 88-95.

Gusteti, M. U. (2024). *Era Digital dalam Kelas Matematika: Menggabungkan Teknologi dengan Alat Peraga Tradisional*. Mega Press Nusantara.

Handayani, B. S. (2025). *Pengaruh Penggunaan Alat Peraga Terhadap Hasil Belajar Ipas Siswa Di Kelas V Sd Negeri 153017 Pahieme 1 Tp 2024/2025* (Doctoral Dissertation, Universitas Quality).

Hasanah, Z., & Himami, A. S. (2021). Model pembelajaran kooperatif dalam menumbuhkan keaktifan belajar siswa. *Irsyaduna: Jurnal Studi Kemahasiswaaan*, *1*(1), 1-13.

Hasriadi, H. (2022). Strategi Pembelajaran.

Murni, I. (2021). Upaya Meningkatkan Hasil Belajar Ipa Materi Sistem Pernafasan Dengan Metode Simulasi Menggunakan Alat Peraga Buatan Peserta Didik Di Kelas Viii-4 Smp Negeri 17 Batanghari Tahun Pembelajaran 2018—2019. *Journal Education of Batanghari*, *3*(2), 141-156.

Nabila, E. E., & Raksun, A. (2024). Upaya Peningkatan Hasil Belajar Biologi Siswa Kelas XA SMAN 1 Suela Pada Materi Bakteri Melalui Pembelajaran Kooperatif Model STAD (Student Teams Achievement Division). *Jurnal Ilmiah Profesi Pendidikan*, *9*(4), 2746-2750

Novianti, R. (2022). Model Pembelajaran Untuk Menumbuhkan Karakter Peduli Lingkungan Mata Pelajaran IPA. *JPB-Jurnal Pendidikan Biologi*, *2*(2), 16-23.

Nurjannah, N., & Khatimah, H. (2022). Upaya meningkatkan hasil belajar mata pelajaran sejarah siswa melalui model pembelajaran example dan non example pada siswa SMA. *Ainara Journal (Jurnal Penelitian Dan PKM Bidang Ilmu Pendidikan)*, *3*(1), 36-41.

Purba, PB, Mawati, AT, Juliana, J., Kuswandi, S., Hulu, IL, Sitopu, JW, ... & Masrul, M. (2021). Penelitian Tindakan Kelas.

Rahayu, S. (2024). *Media Pembelajaran Konsep Dasar, Teknologi Dan Implementasi Dalam Model Pembelajaran*. umsu press.

Rando, A. R., & Pali, A. (2021). Efektivitas Model Pembelajaran Kooperatif Tipe STAD dalam Mengembangkan Keterampilan Sosial. *Mimbar PGSD Undiksha*, *9*(2), 295-300.

Rizki, S. A., Bik, M. T. N., & Susanti, E. (2025). Teori Belajar Kontruktivisme. *Jurnal Pendidikan Sosial dan Humaniora*, *4*(4), 6867-6882.

Sari, W. N., Yamin, M., & Khairuddin, K. (2023). Perbandingan Model Pembelajaran Kooperatif Tipe Student Team Achievement Divisions (STAD) dengan Model Pembelajaran Problem Based Learning (PBL) Berbantuan Power Point terhadap Hasil Belajar Biologi Siswa Kelas XI IPA SMAN 1 Batukliang Tahun 2022. *Jurnal Ilmiah Profesi Pendidikan*, *8*(1), 112-118.

Sholikha, M., & Alwin, A. (2023). Model pembelajaran kooperatif tipe Student Teams Achievement Division untuk meningkatkan hasil belajar kognitif. *Jurnal Educatio FKIP UNMA*, *9*(4), 1818-1824.

Simamora dkk. (2024). *Model-Pembelajaran-Kooperatif-Ebook aprido dkk*

Venty, V. (2023). Penggunaan Media Visual untuk Meningkatkan Pemahaman Konsep Pecahan di Sekolah Dasar. *Jurnal Ilmiah Pendidikan Matematika (jipm)*, *1*(2), 52-59.

Wattimury, I., Souhoka, R., Tuamain, K., & Rupiasa, J. (2023). Pelatihan pembuatan alat peraga sebagai media pembelajaran IPA bagi guru dan siswa SD Kristen Lolotuara. *Jurnal Masyarakat Madani Indonesia*, *2*(2).