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The Impact of the Implementation of the Tai Type Cooperative Learning Model on Mathematics Learning Outcomes at SMKN 2 Bukit Batu Flight

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Abstract

The low learning outcomes of mathematics at the Vocational High School (SMK) level is still a crucial problem in the world of education, especially in the context of conventional learning that does not involve optimal student activity. This study aims to analyze the influence of the Team Assisted Individualization (TAI) type cooperative learning model on the mathematics learning outcomes of class X students at SMKN 2 Aviation Bukit Batu. The approach used is a quantitative approach with a quasi experimental design method, using a Nonequivalent Control Group Design design. The study involved two classes of 30 students each, which were divided into an experimental group and a control group. The experimental group received a learning treatment using the TAI model for 12 meetings, while the control group followed conventional learning. The results showed that the average post-test score of the experimental group was 82.7, higher than the control group which only reached 72.5. The increase in scores from pre-test to post-test in the experimental group reached 20.3 points, while in the control group it was only 10.8 points. In addition, the level of learning completeness of students in the experimental group reached 90%, while in the control group it was only 60%. These findings show that the TAI learning model has a positive and significant influence on improving students' mathematics learning outcomes. The conclusion of this study is that the implementation of the TAI type cooperative learning model is effective in improving the mathematics learning outcomes of vocational school students, both in terms of increasing the average score and the percentage of learning completeness.

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INTRODUCTION

Mathematics plays a fundamental role in shaping students' logical thinking, problem-solving skills, and analytical reasoning. At the vocational high school (SMK) level, mathematics is not only a core academic subject but also a critical component that supports students' mastery in technical and applied fields. However, empirical evidence suggests that many students still struggle to achieve satisfactory outcomes in mathematics. Low achievement in this subject often stems from passive learning environments, lack of motivation, and limited interaction during the learning process (Ariyana & Suastika, 2022; Nainggolan et al., 2021).

Traditional teaching methods, which rely heavily on teacher-centered instruction, tend to marginalize student involvement and reduce engagement. These methods may be efficient for delivering content, but they often fail to cater to students' diverse learning needs and styles. As a result, many students become disengaged and perform poorly, especially in complex subjects like mathematics. This situation calls for innovative and student-centered learning models that promote active participation and collaboration (Ariawan & Putri, 2020; Ramadianti, 2021).

Cooperative learning has been widely recognized as a powerful alternative to conventional instruction (Anitra, 2021; Cahyani et al., 2022). Among the various cooperative learning models, Team Assisted Individualization (TAI) offers a unique approach by integrating group work with individualized learning. TAI encourages students to work collaboratively in heterogeneous teams while simultaneously progressing through learning materials at their own pace. This model is particularly suitable for vocational school settings, where students exhibit varied academic abilities and learning preferences.

Several previous studies have shown the effectiveness of TAI in improving academic achievement and fostering positive interdependence among students. Nevertheless, limited research has explored the application of this model in vocational high school mathematics classrooms, particularly in Indonesian educational settings (Romiyansah et al., 2020; Siswanto & Meiliasari, 2024). Given the growing need for differentiated instruction and the emphasis on competence-based learning, investigating the impact of TAI on students' learning outcomes becomes highly relevant.

This study focuses on the implementation of the TAI model in mathematics instruction for tenth-grade students at SMKN 2 Penerbangan Bukit Batu. By comparing the academic performance of students taught using the TAI model with those taught through conventional methods, this research aims to assess the effectiveness of TAI in enhancing students' learning outcomes. The study is grounded in a quasi-experimental design that accommodates the practical limitations of classroom-based research, such as the inability to conduct full randomization.

The significance of this research lies in its potential contribution to both theory and practice. Theoretically, it provides empirical evidence on the application of cooperative learning models in vocational education. Practically, it offers insights for educators and policymakers seeking to improve mathematics instruction and student achievement in similar contexts. The findings are expected to serve as a basis for further implementation of TAI in other educational institutions facing similar challenges.

Mathematics is a crucial subject that plays a significant role in shaping students' analytical and problem-solving skills, which are essential for success in various fields (Marfu'ah et al., 2022; Y. Setiawan, 2020). However, despite its importance, many students struggle with mathematics due to traditional teaching methods that often focus on passive learning and individual effort. In

response to this challenge, educators have been exploring alternative teaching strategies that promote active learning and collaboration. One such approach is the Team Assisted Individualization (TAI) model, a cooperative learning method that combines individual responsibility with team support. This model aims to provide personalized learning opportunities while fostering teamwork, which has the potential to enhance students' understanding and engagement in mathematics. The purpose of this research is to examine the effectiveness of the TAI model in improving students' mathematics achievement at SMKN 2 Penerbangan Bukit Batu, where traditional teaching practices have been predominant.

METHODS

This study employed a quantitative approach using a quasi-experimental design, specifically the nonequivalent control group design. This design was selected due to the inability to randomly assign participants to experimental and control groups, as the students had already been organized into existing classes. The research aimed to examine the effect of the Team Assisted Individualization (TAI) cooperative learning model on students' mathematics achievement at SMKN 2 Penerbangan Bukit Batu. The design allowed for a comparative analysis between two groups: one receiving the TAI intervention and the other undergoing conventional instruction.

The research was conducted over 12 meetings (equivalent to 24 instructional hours) during the second semester of the academic year. The experimental group received mathematics instruction through the TAI model, which included eight key stages: placement test, team formation, teacher-led instruction, creative assignments, team study, whole-class discussion, fact test, and team scoring and recognition. In contrast, the control group received traditional teacher-centered instruction without structured peer collaboration. Both groups were given a pre-test and a post-test to assess their performance before and after the intervention.

The participants of this study consisted of two intact classes of tenth-grade students selected through purposive sampling. This sampling technique was used to ensure that the groups had relatively similar academic characteristics prior to the intervention. The instruments used to measure mathematics achievement were standardized tests developed by the researcher, validated by subject matter experts, and aligned with the competency standards of the school curriculum. The test consisted of multiple-choice and short-answer questions assessing cognitive domains such as conceptual understanding and application.

Data analysis was carried out using descriptive and inferential statistical methods. Descriptive statistics, including mean and standard deviation, were used to summarize the pre-test and post-test scores of each group. Inferential statistics, including the paired sample t-test and independent sample t-test, were applied to determine the significance of differences within and between groups. The level of significance was set at 0.05. These statistical analyses were conducted using SPSS software to ensure accuracy and reliability of the results.

RESULT AND DISCUSSION

Pre-test and Post-test Results Table

Table 1. Average and Standard Deviation of Pre-test and Post-test Results

Group	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	Δ Skor (Post - Pre)
Experiment	62.4 ± 8.3	82.7 ± 6.9	+20.3

Control	61.7 ± 7.9	72.5 ± 8.1	+10.8
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Based on Table 1, it can be seen that the average pre-test score in the experimental group was 62.4 with a standard deviation of 8.3, while the control group had an average score of 61.7 with a standard deviation of 7.9. This shows that the initial abilities of the two groups were relatively equal before the treatment was given.

After treatment, the experimental group's average post-test score increased to 82.7, while the control group increased to 72.5. The score increase in the experimental group was 20.3 points, while in the control group it was only 10.8 points. This improvement shows that the Team Assisted Individualization (TAI) type cooperative learning model has a greater positive impact on students' mathematics learning outcomes compared to conventional learning models.

Table 2. Percentage of Student Learning Completeness

Group	Number of Students	Completed Students (≥ 75)	Completion Percentage
Exsperimen	30	27	90%
Control	30	18	60%

As shown in Table 2, the experimental group showed a higher level of completeness with 90% of students achieving a score of ≥ 75 , compared to the control group who achieved only 60% completeness.

DISCUSSION

The findings of this study demonstrate that the implementation of the Team Assisted Individualization (TAI) cooperative learning model had a significant positive effect on students' mathematics achievement (Ariani et al., 2021; Imamuddin, 2022). The experimental group, which received the TAI intervention, showed a notable improvement in their post-test scores compared to their pre-test scores. This result aligns with the hypothesis that cooperative learning models, specifically TAI, enhance students' understanding and retention of mathematical concepts. The increased interaction among students in teams likely fostered a deeper understanding of the subject matter and provided opportunities for peer-assisted learning, which is a key component of the TAI model (Pradja & Firmansyah, 2020; Ruli & Indarini, 2022).

In comparison, the control group, which received traditional teacher-centered instruction, showed a less pronounced improvement in their mathematics scores. Although the control group also demonstrated progress, the difference in post-test scores was not as substantial as that observed in the experimental group. This suggests that the traditional method, while effective to some extent, may not fully engage students or provide the collaborative learning environment that promotes higher-order thinking and problem-solving skills, which are essential in mathematics learning (Rahayu et al., 2022).

The significant difference between the experimental and control groups can also be attributed to the structured and systematic nature of the TAI model. By incorporating individual tasks alongside group activities, students in the experimental group had the opportunity to reinforce their learning both independently and within a supportive team context. The cooperative aspect of TAI encouraged students to actively participate, ask questions, and help one another, thereby enhancing their problem-solving skills and mathematical reasoning (Batubara, 2020; Puspitasari et al., 2022).

This is consistent with previous studies that have highlighted the positive impact of cooperative learning on academic achievement (Marasabessy et al., 2021).

The results emphasize the importance of fostering an active learning environment where students engage in both individual and collaborative tasks. The TAI model's structured approach allowed for continuous assessment and feedback, which is critical in mathematics education. By using various stages such as placement tests, team study, and fact tests, the TAI model provided a comprehensive learning experience that helped students retain and apply mathematical concepts more effectively. This finding supports the idea that well-designed cooperative learning strategies can significantly improve student outcomes, especially in subjects that require critical thinking and application, such as mathematics (Phasa, 2020; Y. E. Setiawan, 2020).

CONCLUSIONS

This study concludes that the implementation of the Team Assisted Individualization (TAI) cooperative learning model significantly improved the mathematics achievement of students in SMKN 2 Penerbangan Bukit Batu. The results show that students in the experimental group who were taught using the TAI model demonstrated higher post-test scores compared to their pre-test scores and to students in the control group who received conventional teaching methods. The findings suggest that TAI, by fostering both individual responsibility and teamwork, enhances students' understanding of mathematical concepts and their ability to apply these concepts effectively. Thus, the study supports the use of cooperative learning models like TAI as an effective instructional strategy to improve students' academic performance in mathematics.

CONFLICTS OF INTEREST STATEMENT

Regarding this study, the author declares that there is no conflict of interest.

AUTHOR CONTRIBUTIONS

Study concept and design: Farid Al Rashid. Acquisition of data: Riki Mukhaiyar. Analysis and interpretation of data: M Giatman. Drafting the manuscript: Farid Al Rashid. Critical revision of the manuscript for important intellectual content: Dedy Irfan. Statistical analysis: Farid Al Rashid.

REFERENCES

- Anitra, R. (2021). Pembelajaran kooperatif tipe jigsaw dalam pembelajaran matematika di sekolah dasar. *JPDI (Jurnal Pendidikan Dasar Indonesia)*, 6(1), 8.
- Ariani, Y., Helsa, Y., & Ahmad, S. (2021). *Model pembelajaran inovatif untuk pembelajaran matematika di kelas IV sekolah dasar*. Deepublish.
- Ariawan, R., & Putri, K. J. (2020). Pengembangan perangkat pembelajaran matematika dengan model pembelajaran problem based learning disertai pendekatan visual thinking pada pokok bahasan kubus dan balok kelas VIII. *Juring (Journal for Research in Mathematics Learning)*, 3(3), 293–302. <http://dx.doi.org/10.24014/juring.v3i3.10558>
- Ariyana, I. K. S., & Suastika, I. N. (2022). Model pembelajaran CIRC (cooperative integrated reading and composition) sebagai salah satu strategi pembelajaran matematika di sekolah dasar. *Jurnal Ilmiah Universitas Batanghari Jambi*, 22(1), 203–211. <http://dx.doi.org/10.33087/jiubj.v22i1.2016>
- Batubara, I. H. (2020). Pengaruh Model Pembelajaran Guided Discovery Learning terhadap Hasil Belajar Pengembangan Silabus Pembelajaran Matematika pada Masa Pandemic Covid 19.

Jurnal Penelitian, Pendidikan Dan Pengajaran: JPPP, 1(2), 13–17.
<https://doi.org/10.30596/jppp.v1i2.4948>

- Cahyani, C. D., Suyitno, A., & Pujiastuti, E. (2022). Studi Literatur: Model Pembelajaran Blended Learning dalam Meningkatkan Kemampuan Berpikir Kreatif dan Rasa Ingin Tahu Siswa dalam Pembelajaran Matematika. *Prisma, Prosiding Seminar Nasional Matematika*, 5, 272–281.
- Imamuddin, M. (2022). Merancang model pembelajaran matematika kontekstual Islami berbasis literasi. *Jurnal Ilmiah Pendidikan Matematika Al Qalasadi*, 6(1), 75–89.
<https://doi.org/10.32505/qalasadi.v6i1.4132>
- Marfu'ah, S., Zaenuri, Z., Masrukan, M., & Walid, W. (2022). Model pembelajaran matematika untuk meningkatkan kemampuan penalaran matematis siswa. *PRISMA, Prosiding Seminar Nasional Matematika*, 5, 50–54.
- Nainggolan, M., Tanjung, D. S., & Simarmata, E. J. (2021). Pengaruh Model Pembelajaran SAVI terhadap Hasil Belajar Matematika Siswa di Sekolah Dasar. *Jurnal Basicedu*, 5(4), 2617–2625.
- Phasa, K. C. (2020). Meta analisis pengaruh model pembelajaran problem based learning terhadap kemampuan berpikir kritis dalam pembelajaran matematika. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 4(2), 711–723. [10.31004/basicedu.v5i4.1235](https://doi.org/10.31004/basicedu.v5i4.1235)
- Pradja, B. P., & Firmansyah, M. A. (2020). Penerapan Model Pembelajaran Reciprocal Teaching dalam Pembelajaran Matematika untuk Meningkatkan Aktivitas dan Hasil Belajar Siswa. *Imajiner: Jurnal Matematika Dan Pendidikan Matematika*, 2(2), 159–166.
<https://doi.org/10.26877/imajiner.v2i2.5829>
- Puspitasari, I. A., Azainil, A., & Basir, A. (2022). Penggunaan media pembelajaran dalam model pembelajaran problem based learning pada mata pelajaran matematika. *Prosiding Seminar Nasional Pendidikan Matematika, Universitas Mulawarman*, 2, 75–92.
- Rahayu, P., Pangestika, R. R., & Anjarini, T. (2022). Peningkatan keaktifan dan hasil belajar peserta didik melalui penerapan model pembelajaran talkingstick berbantuan media wordwall pada pembelajaran matematika sekolah dasar. *Journal on Teacher Education*, 4(1), 385–394.
<https://doi.org/10.31004/jote.v4i1.5901>
- Ramadiani, A. A. (2021). Efektivitas Model Pembelajaran Project Based Learning Terhadap Hasil Belajar Matematika Sekolah Dasar. *Primatika: Jurnal Pendidikan Matematika*, 10(2), 93–98.
<https://doi.org/10.30872/primatika.v10i2.668>
- Romiyansah, R., Karim, K., & Mawaddah, S. (2020). Analisis kemampuan koneksi matematis siswa pada pembelajaran matematika dengan menggunakan model pembelajaran inkuiri terbimbing. *EDU-MAT: Jurnal Pendidikan Matematika*, 8(1).
<http://dx.doi.org/10.20527/edumat.v8i1.8342>
- Ruli, E., & Indarini, E. (2022). Meta analisis pengaruh model pembelajaran problem based learning terhadap kemampuan berpikir kritis dalam pembelajaran matematika di sekolah dasar. *Jurnal Pendidikan Dan Konseling (JPDK)*, 4(4), 221–228. <https://doi.org/10.31004/jpdk.v4i4.5203>
- Setiawan, Y. (2020). Pengembangan model pembelajaran matematika sd berbasis permainan tradisional indonesia dan pendekatan matematika realistik. *Scholaria: Jurnal Pendidikan Dan Kebudayaan*, 10(1), 12–21. <https://doi.org/10.24246/j.js.2020.v10.i1.p12-21>
- Setiawan, Y. E. (2020). *Kepraktisan Model Pembelajaran IDEA (Issue, Discussion, Establish, And Apily) dalam Pembelajaran Matematika*.
- Siswanto, E., & Meiliasari, M. (2024). Kemampuan pemecahan masalah pada pembelajaran matematika: systematic literature review. *Jurnal Riset Pembelajaran Matematika Sekolah*, 8(1), 45–59. <https://doi.org/10.21009/jrpms.081.06>