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The Effectiveness of the Team Teaching Method in Improving Conceptual Understanding and Learning Motivation of Grade VII Junior High School

Julanda Adriana.Wakum[1], C. Asri Budiningsih[2]
[1.2]Universitas Negeri Yogyakarta, Indonesia

[1]julandaadriana.2023@student.uny.ac.id

Abstract

This study used a quantitative approach with a quasi-experimental design (non-equivalent control group) to analyze the effect of the team teaching method on students' conceptual understanding and learning motivation at SMP Negeri 4 Sentani. The research sample consisted of two groups, namely the experimental group (27 students) who participated in learning using the team teaching method and the control group (28 students) who participated in conventional learning. Data collection was conducted through a five-point Likert scale questionnaire, student engagement observation sheets, and assignment scores as supporting data. The instruments were tested for content and construct validity as well as reliability using Cronbach's Alpha, with all values meeting the standard of >0.70, so the instruments were declared valid and reliable. Data analysis using SmartPLS included factor loading, AVE, cross loading, correlation, composite reliability (rho_c), and R-squared. The results of the study indicate that the team teaching method has a significant effect on students' conceptual understanding and learning motivation. The factor loading values of the team teaching method indicators are very high (0.941–0.959), while the conceptual understanding and learning effectiveness indicators also show high values (0.865–0.979), indicating the success of this method in increasing student engagement and understanding. The AVE value above 0.5 and composite reliability >0.9 indicate that the instrument used is valid and consistent. Correlation analysis shows a strong relationship between the team teaching variable and conceptual understanding (0.991), learning effectiveness (0.989), and learning motivation (0.984). These results confirm that the application of team teaching not only improves material comprehension but also significantly encourages student learning motivation. In conclusion, the team teaching method is effective in improving students' conceptual understanding and learning motivation at SMP Negeri 4 Sentani. This study recommends the routine application of collaborative methods and the exploration of other external factors that can further improve student learning motivation.
Keywords: Team Teaching Method for Grade VII Students of SMP Negeri 4 Sentani

Introduction

21st century education demands a paradigm shift in the teaching and learning process, from teacher-centered learning to student-centered learning.(Kaharap & Perdana, 2025) ,In this context, teachers are expected to be able to apply learning methods that encourage students to be active, creative, and collaborative.(Nuriah et al., 2025) ,One form of learning that is relevant to the demands of the times is learning that integrates Information and Communication Technology (ICT) into teaching and learning activities. Mastery of ICT is now a basic competency that students must possess to compete in the digital era. Thus, the team teaching method serves as a bridge between curriculum requirements and practical learning needs in Informatics. competencies such as computational thinking, problem-solving, and responsible use of

technology.(Shinwari, 2025). Informatics subjects emphasize not only technical skills in operating software but also develop logical, systematic, and creative thinking. Through Informatics learning, students are expected to understand how technology can be used productively and ethically in everyday life.(Chen, 2025)In the context of Informatics learning at SMP Negeri 4 Sentani, the basic skills taught include At the junior high school level, this learning covers the use of word processing applications to create and compile documents, numerical data processing using spreadsheet software, and a basic understanding of computers and the internet, including their functions, how they work, and their application in everyday life.One of the basic competencies that is the main focus is the ability to use Microsoft Word as a word processing application.(Prahestiningtyas & Sulisworo, 2022)Mastery of Microsoft Word is considered essential because it forms the foundation for developing students' digital literacy skills. Mastering this application allows students to learn to type, edit, format text, and organize documents systematically.(Teguh et al., 2024)These skills are also essential for future academic and non-academic activities. In practice, Microsoft Word learning at SMP Negeri 4 Sentani still faces several challenges. Based on initial observations and interviews with Informatics teachers, it was discovered that Most students have difficulty understanding the functions of icons and menus on the application interface. This difficulty slows them down in completing tasks, as it takes them longer to find the appropriate commands. In addition, their lack of experience in using similar applications causes students to often hesitate in choosing the right features. These conditions indicate that students need more structured guidance and learning methods that can help them recognize the features of the application more effectively.(Atatu, 2023),They tend to memorize procedural steps without understanding the ,concepts behind each command. The analysis also showed that approximately 65% of students had not achieved the Learning Outcome Criteria (KCP) for basic Microsoft Word material. Meanwhile, only 35% of students were able to complete assignments independently and according to instructions.(Bahtiar, 2022)This situation indicates a gap between learning objectives and learning outcomes. In addition to poor conceptual understanding, students' motivation to learn is also relatively low. Interviews revealed that most Most students admit that they are less interested in computer science because they find the subject difficult. Lack of facilities, such as computers, is also an additional obstacle that hinders the learning process of students. (Ellederová & Denysenko, 2025)In terms of learning methods, Education still uses conventional approaches such as lectures and demonstrations in front of the class. In this method, students simply watch the teacher perform steps on a projector screen without much opportunity to interact or ask questions. This makes students passive and quickly lose interest in learning. This problem indicates the need for innovation in learning strategies to increase active student participation and help them understand the material more deeply. One alternative method that can be applied is the team teaching method.(Görkem Celasun et al., 2025). The team teaching method is a collaborative learning model that involves two or more teachers working together to plan, implement, and evaluate the learning process for the same group of students. This model allows for a division of roles between teachers to make learning more effective and interactive.(Manzocco et al., 2025)In the context of Informatics learning, the team teaching method can provide significant benefits. One teacher can focus on providing explanations and demonstrations in front of the class, while another teacher assists students who are experiencing difficulties directly in the computer lab. This approach makes the learning process more personalized and efficient. Based on cognitive theory, effective learning occurs when students can connect new information with existing knowledge. In team teaching, teachers can more easily provide elaboration and reinforcement of concepts according to the students' level of understanding.(Tang & Bosch, 2025)Humanistic theory also serves as an important

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foundation for the implementation of team teaching. This theory emphasizes the importance of addressing students' emotional and social needs during the learning process. Through collaboration between two teachers, students can receive greater emotional support and thus be more motivated to learn.(Annetta et al., 2025)Furthermore, constructivist theory emphasizes that knowledge is constructed through social interactions and meaningful activities. In team teaching, students not only receive information from the teacher but also have the opportunity to discuss, collaborate, and construct their own understanding based on their learning experiences.(Li-Wen & Yu Hou, 2025)Several previous studies have shown that team teaching has a positive impact on student learning outcomes, with a 35% increase in conceptual understanding and a 37% increase in learning motivation after implementing this method.(Wulff et al., 2025), also stated that team teaching is effective in improving computational thinking and student engagement in digital technology-based lessons. Collaboration between teachers makes learning more lively, interactive, and easier to understand.(Wulff et al., 2025), added that implementing co-teaching in technology classes successfully increased student participation by 43% and conceptual understanding by 39% compared to single-teaching methods. This proves that collaboration between teachers can be an effective solution to address the complexities of technology-based learning.(Palines et al., 2025).

Based on the results of the study, the team teaching method is considered to have the potential to be applied at SMP Negeri 4 Sentani, especially in Informatics learning. Collaboration between teachers makes it easier for students to understand basic concepts and motivates them to learn actively. This method is also relevant for schools with limited infrastructure. With two teachers working together, limitations in the number of computers and practice time can be overcome through efficient division of tasks and roles. In addition, the team teaching approach can help build a collaborative culture in the school environment. Teachers no longer work individually but share responsibilities and experiences to achieve common learning goals. In the context of seventh-grade students, this method also provides opportunities to build positive social interactions. Students feel more cared for because they receive direct support, which increases their confidence and motivation. Team teaching also provides space for teachers to engage in collaborative reflection. Through collective reflection, teachers can evaluate the effectiveness of teaching strateg

Method

This research method uses a quantitative approach with a quasi-experimental design (non-equivalent control group).The respondents were students from SMP Negeri 4 Sentani. Data collection was conducted using a questionnaire designed to measure various variables, including conceptual understanding, learning effectiveness, learning motivation, teaching methods, and student understanding. This questionnaire used a five-point Likert scale, ranging from “strongly disagree” to “strongly agree,” allowing researchers to quantitatively assess students' response tendencies. Each variable was measured using several statement items; for example, the conceptual understanding variable contained five items, one of which was an indicator such as “I can explain the functions of icons and menus in the application used.” In addition to the questionnaire, the study also utilized additional measurement tools in the form of observation sheets to observe student engagement during the learning process, as well as assignment scores as supporting data to assess student abilities more objectively. This approach ensures that the data obtained is more comprehensive and reflects the actual learning conditi The questionnaire consists of several indicators that have undergone validity and reliability testing to ensure the suitability of the instrument. The validity used is content validity and construct

validity. Content validity was obtained through expert assessment to ensure that each indicator truly represented the concept being measured, while construct validity was tested using inter-item correlation analysis to examine the consistency of the relationship between indicators in a single variable. Furthermore, the reliability of the instrument was tested using Cronbach's Alpha, as this method is commonly used to assess internal consistency in Likert Scale-based questionnaires. An alpha value that meets the standard (>0.70) indicates that the instrument has a good level of reliability.(Al Mazroui & Abu Rıes, 2024)In addition, data analysis was carried out using SmartPLS software to evaluate the measurement model and structural model, thus producing in-depth information regarding the influence of the team teaching method on students' understanding and learning motivation.

Population and Sample

This study involved seventh-grade students at SMP Negeri 4 Sentani, who constituted the study population. The population consisted of two groups: an experimental group and a control group. The experimental group included 27 students who participated in learning using the team teaching method, while the control group consisted of 28 students in seventh-grade A who participated in the conventional learning method.(Wardani et al., 2024). The sample determination was carried out using In this study, the sampling technique used was purposive sampling, which is the selection of samples based on certain criteria relevant to the research objectives. The sample criteria covered several aspects, including: classes that had the same computer science learning schedule, teachers who were willing to implement team-based teaching methods, and the availability of laboratory facilities or devices that supported the learning process. By using these criteria, the selected sample was expected to provide representative and relevant data for analyzing the effectiveness of teaching methods and students' understanding of computer science material.(Dahlan, 2019)Thus, both groups are expected to be representative of the population in order to evaluate the effect of the team teaching method on students' conceptual understanding and learning motivation. The use of these two groups also allows for a clear comparison between the effectiveness of the methods used.

Operational Definition of Variables

The operational definition of the variables in this study includes several key aspects that are relevant for measurement and analysis. ,(Cvetković et al., 2024) Collaborative teaching involves more than one teacher in creating an interactive and engaging learning experience. For research purposes, the variable of collaborative teaching is operationally defined as a learning strategy in which teachers work together in planning, implementing, and evaluating learning activities so that students actively participate in teams. This variable is measured through a questionnaire with specific indicators, namely: (1) joint lesson planning by teachers, (2) collaborative implementation of learning activities, and (3) team feedback. The assessment scale uses a five-point Likert scale, from 1 (strongly disagree) to 5 (strongly agree). The instrument item for the indicator of collaborative learning activity implementation is: “Teachers carry out learning activities by actively involving all team members.” With this operational definition, the collaborative teaching variable can be measured systematically and consistently. measured through a questionnaire that assesses student engagement and the impact on their learning motivation. Learning Effectiveness is defined as the extent to which students achieve learning objectives, measured through understanding the material and the ability to apply concepts. Student Learning Motivation is the drive that encourages students to be active in the learning process, while the Team Teaching Method indicates a teaching approach in which several teachers teach simultaneously with a focus on interaction techniques. Finally, Understanding

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Student Concepts reflects the level of student understanding of the material, evaluated through questionnaires and student exam results.

Table 1. Standard Variables and SmartPLS Test Components

No	Variables	Component
1	Team Teaching Method X	1. Teachers plan learning collaboratively 2. Division of roles between main teacher and assistant teacher 3. Effective communication and coordination between teachers 4. Direct assistance to students during practice Evaluation of learning outcomes is carried out together
2	Student Concept Understanding Y1	1. Students are able to identify Microsoft Word menus and icons. 2. Students are able to explain the function of each icon 3. Students can use Word features correctly 4. Students are able to connect Word concepts with new situations. Students are able to complete word processing tasks independently
3	Y2 Students' Learning Motivation	1. Students show interest in Informatics lessons 2. Students try to understand the material without coercion 3. Students actively ask questions or discuss in class 4. Students diligently complete assignments on time Students participated in computer practice with enthusiasm.
4	Z1 Learning Effectiveness	1. There is active interaction between teachers and students 2. Suitability of the method to student characteristics 3. Availability of adequate time and learning facilities 4. Achievement of learning objectives according to KCP Improvement in learning outcomes after implementing team teaching
5	The Influence of Team Teaching on Z2's Understanding and Motivation	1. The relationship between the application of methods and increased understanding 2. The relationship between the application of methods and increased motivation 3. The relationship between conceptual understanding and learning motivation 4. Integration between teachers and students in the learning process Overall improvement in learning outcomes after intervention

Data Analysis Techniques

Data analysis in this study involved several key techniques, namely autor loading, average extracted variance (AVE), cross loadings, correlations, composite reliability (rho_c), and R-squared. Autor loading measures the contribution of indicators to the construct, with a value >0.7 indicating relevance and reliability (Yuling et al., 2025). AVE assesses construct validity, where a value >0.5 indicates the construct's ability to explain more than half of the indicator

variance (Duangngern et al., 2025). Cross loadings ensure that higher indicators load on related constructs rather than other constructs (Bin and Chansirisira, 2025). Correlation analysis shows the strength of the relationship between variables, while composite reliability (rho_c) assesses the internal consistency of indicators, with a value >0.7 considered good. Finally, R-squared shows the proportion of variation in the dependent variable explained by the independent variables, so a high value indicates the effectiveness of the model.

Results

Auter loading

Aut load refers to the process of measuring how strongly an observed variable is affected by the underlying construct in a structural model.(Liu et al., 2025)In the context of learning for seventh-grade students at SMP Negeri 4 Sentani, understanding of author loading is crucial to demonstrate the effectiveness of the applied teaching methods. By using factor analysis and structural models, teachers can analyze data collected from student learning outcomes and understand how well various teaching variables—such as methods, media, and interactions—can influence student understanding and achievement.(Derilo, 2025)This allows adjustments in the teaching and learning process to improve students' academic outcomes and ensure that the approach used is appropriate to their needs. The results of the Auter Loading Test can be seen in Figure 1 as follows.

Auter Test Results

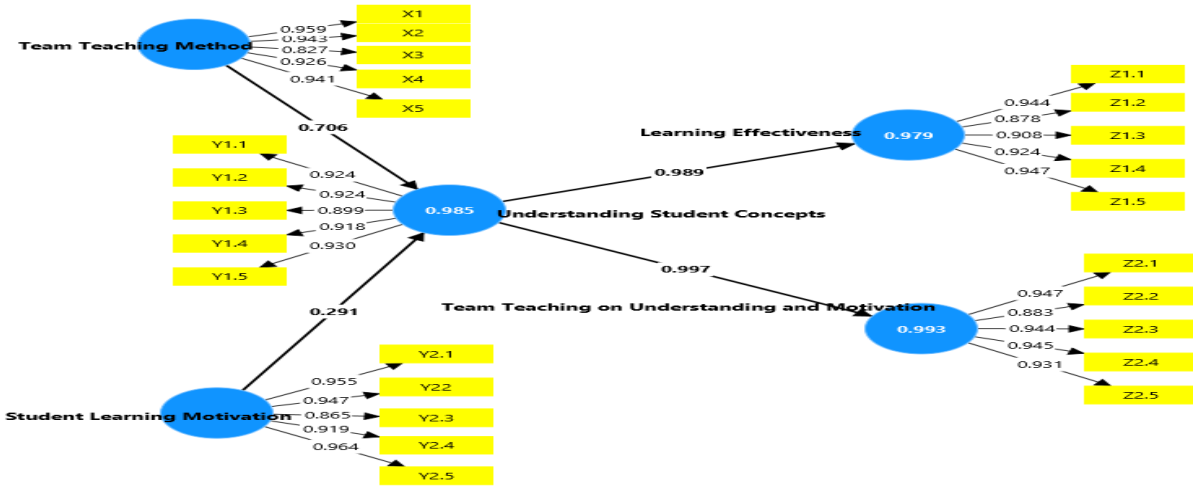


Figure 1. Results of the Auto Loading Test

The results of the Auter loading analysis found that the team teaching method had a significant influence on students' conceptual understanding at SMP Negeri 4 Sentani. The factor loading for the team teaching method indicator was very high, especially for indicators X1, X2, and X5, which reached values above 0.9. This indicates that this collaborative learning approach successfully increased student engagement and helped them understand the material more deeply. In addition, learning effectiveness (Y2) was also shown to increase, with a factor loading reaching 0.979, which confirms that students not only understood the concept, but were also able to apply it in different contexts. Furthermore, student learning motivation showed positive results, with most indicators having loadings above 0.9. This indicates that students who understand the material well tend to have high learning motivation. However, there was one indicator (Y3.1) with a loading of 0.291 which highlighted challenges in increasing motivation, possibly caused by external factors that need attention. Overall, these findings illustrate that the

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application of the team teaching method is very effective in improving students' understanding and motivation to learn, but also shows the importance of considering other factors that can influence their motivation to learn. To clarify the depth of the data, the results of the Auter loading test can be seen in table 2 as follows.

Table 2. Auter loading test results

Variables	Team Teaching on Understanding and Motivation	Learning Effectiveness	Student Learning Motivation	Team Teaching Method	Understanding Student Concepts	Valid
X1				0.959		Valid
X2				0.943		Valid
X3				0.827		Valid
X4				0.926		Valid
X5				0.941		Valid
Y1.1					0.924	Valid
Y1.2					0.924	Valid
Y1.3					0.899	Valid
Y1.4					0.918	Valid
Y1.5					0.930	Valid
Y2.1			0.955			Valid
Y2.3			0.865			Valid
Y2.4			0.919			Valid
Y2.5			0.964			Valid
Y22			0.947			Valid
Z1.1		0.944				Valid
Z1.2		0.878				Valid
Z1.3		0.908				Valid
Z1.4		0.924				Valid
Z1.5		0.947				Valid
Z2.1	0.947					Valid
Z2.2	0.883					Valid
Z2.3	0.944					Valid
Z2.4	0.945					Valid
Z2.5	0.931					Valid

Based on the presented table.2 factor loading, several important findings can be identified regarding the influence of the team teaching method on students' understanding and learning motivation. First, for the Team Teaching Method variable, indicators such as X1 (0.959), X2 (0.943), and X5 (0.941) show very high loadings, indicating that this method is very effective in facilitating students' understanding of the concepts taught. In addition, indicators X3 (0.827) and X4 (0.926) are also valid, although with slightly lower loadings. This shows that all indicators in this category contribute significantly to the success of the team teaching method in learning. Second, in the Understanding Student Concepts variable, indicators Y1.1 to Y1.5 show very

good factor loadings, ranging from 0.899 to 0.924, indicating that students have a good understanding of the material after applying this method. On the other hand, for the Learning Effectiveness variable, indicators Y2.1 (0.955) and Y2.5 (0.964) provide an illustration that the learning effectiveness is also very high. However, several indicators, such as Y2.3 (0.865), still show potential for improvement. For student learning motivation, indicators Z1.1 to Z1.5 and Z2.1 to Z2.5 also show significant loading values above 0.8, confirming a positive relationship between the team teaching method and increased student learning motivation. Overall, these findings emphasize the importance of implementing collaborative methods in improving student understanding and motivation in the classroom.

Average variance (AVE)

Average variance extracted (AVE) refers to a measure used to assess how well a model can explain variation in data, and in the context of AVE Team Teaching at SMP Negeri 4 Sentani, it plays a crucial role in determining the effectiveness of this approach. With several teachers working together, the learning process becomes more interactive and enjoyable, which has a positive impact on the conceptual understanding of seventh-grade students. Through AVE analysis, researchers can develop the extent to which this collaborative method strengthens learning motivation and mastery of the material by students, ensuring that learning is not only easy to understand but also able to increase student engagement in the learning process.(Permana et al., 2025)The results obtained from the AVE analysis can provide valuable insights for the development of more effective teaching strategies in the future. The results of the Average Variance Extracted (AVE) values can be seen in Table 3 as follows.

Table.3 Average variance extracted (AVE)

Variables	Average variance extracted (AVE)	Information
Team Teaching on Understanding and Motivation	0.865	Valid
Learning Effectiveness	0.847	Valid
Student Learning Motivation	0.866	Valid
Team Teaching Method	0.847	Valid
Understanding Student Concepts	0.845	Valid
Team Teaching on Understanding and Motivation	0.865	Valid
Learning Effectiveness	0.847	Valid
Student Learning Motivation	0.866	Valid
Team Teaching Method	0.847	Valid
Understanding Student Concepts	0.845	Valid

Based on the extracted average variance (AVE) results in Table 3, AVE was used to test convergent validity, it can be identified that all variables analyzed in this study are valid with values that indicate good consistency in measurement. First, for the Team Teaching on Understanding and Motivation variable, the AVE value of 0.865 indicates that the team teaching method has a significant influence on student understanding and motivation. This indicates that approximately 86.5% of the variation in student understanding and motivation can be explained by this variable. In addition, the Learning Effectiveness variable with an AVE value of 0.847 also indicates that learning effectiveness is well measured, while the Student Learning Motivation variable has the highest AVE value at 0.866, confirming that student learning motivation is strong and consistent in measurement. Other variables, namely Team Teaching Method and

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Understanding Student Concepts, have AVE values of 0.847 and 0.845, respectively, which also indicate validity in their measurements. Overall, all variables show AVE values above 0.5, which indicates that the measurement instrument used in this study is valid and reliable.

Cross Loadings

Cross loadings is an analysis used to assess the extent to which an observed variable is related to several constructs in the model, and in the context of Team Teaching at SMP Negeri 4 Sentani, this analysis can provide valuable insights regarding the effectiveness of collaboration between teachers.(Hanchingchai et al., 2025),Through the Team Teaching approach, various teaching methods are applied simultaneously, allowing students to gain a broader and deeper perspective on the subject matter. By examining cross-loadings, educators can identify which variables contribute most to student understanding and motivation, as well as trigger interactions between different teaching techniques. The results of this analysis can help improve adaptive and responsive learning strategies, thereby supporting better academic achievement for seventh-grade students. To find out the results of the Cross-loading test, please see Table 4 as follows.

Table 4. Cross loading test results

Variables	Team Teaching on Understanding and Motivation	Learning Effectiveness	Student Learning Motivation	Team Teaching Method	Understanding Student Concepts	Information
X1	**0.938**	0.942	0.922	0.959	0.947	Valid
X2	**0.917**	0.911	0.919	0.943	0.920	Valid
X3	**0.857**	0.835	0.849	0.827	0.858	Valid
X4	**0.901**	0.917	0.905	0.926	0.914	Valid
X5	**0.913**	0.916	0.919	0.941	0.919	Valid
Y1.1	0.923	**0.907**	0.875	0.898	0.924	Valid
Y1.2	0.913	**0.921**	0.923	0.943	0.924	Valid
Y1.3	0.904	**0.872**	0.921	0.895	0.899	Valid
Y1.4	0.916	**0.911**	0.869	0.905	0.918	Valid
Y1.5	0.926	**0.935**	**0.932**	0.914	0.930	Valid
Y2.1	0.930	0.934	**0.955**	0.946	0.935	Valid
Y2.2	0.878	0.867	**0.865**	0.866	0.879	Valid
Y2.3	0.892	0.911	**0.919**	0.907	0.896	Valid
Y2.4	0.946	0.931	**0.964**	0.928	0.938	Valid
Y2.5	0.929	0.923	**0.947**	0.919	0.927	Valid
Z1.1	0.936	0.944	0.916	**0.934**	0.937	Valid
Z1.2	0.887	0.878	0.874	**0.850**	0.885	Valid
Z1.3	0.894	0.908	0.893	**0.902**	0.885	Valid
Z1.4	0.906	0.924	0.932	**0.915**	0.919	Valid
Z1.5	0.925	0.947	0.902	**0.922**	0.925	Valid
Z2.1	0.947	0.932	0.911	0.936	**0.940**	Valid
Z2.2	0.883	0.883	0.912	0.893	**0.895**	Valid
Z2.3	0.944	0.925	0.912	0.907	**0.930**	Valid
Z2.4	0.945	0.941	0.952	0.944	**0.944**	Valid
Z2.5	0.931	0.915	0.888	0.897	**0.924**	Valid

The results of the Cross-loading test in Table 4 above are explained below. Each indicator has a higher loading value on the expected construct compared to other constructs, which indicates that the measurement instrument can differentiate between different variables well. Indicator X1 has the highest loading value on Team Teaching Method (0.959) and also shows significant values on other related constructs, such as Learning Effectiveness (0.942) and Student Learning Motivation (0.922). Similar things are also seen in other indicators such as X2, X4, and X5, which show loadings above 0.9 on the Team Teaching Method construct. Indicators from Understanding Student Concepts, such as Y1.1 to Y1.5, also show good loading values, ranging from 0.904 to 0.926, indicating accuracy in measuring student understanding. Furthermore, indicators on Learning Effectiveness, such as Y2.1 and Y2.4 which have loadings of 0.930 and 0.946, respectively, show consistent and valid results. On the other hand, indicators Z1.1 and Z2.1 related to Student Learning Motivation showed no less significant values, with loadings above 0.9. These cross-loading results provide confidence that all constructs measured in this study have high validity, thus supporting the hypothesis about the effectiveness of the team teaching method in improving student understanding and learning motivation.

Correlation

Correlation is a statistical measure that indicates the extent to which two variables are related to each other. In the context of learning at SMP Negeri 4 Sentani, correlation analysis is crucial for understanding the relationship between various factors that influence student achievement. For example, by analyzing the correlation between the teaching methods used and student participation levels, teachers can determine which techniques are most effective in improving student comprehension.(Parohl & Bussiere-Prytula, 2025),In addition, correlation can also be applied to create a relationship between student learning motivation and the academic results achieved.(Hamid & Misnar, 2025)With this information, educators can develop better strategies to enhance the learning experience, so that students can reach their maximum potential. The results of the correlation test can be seen in table 5 as follows.

Table 5. Correlation test results

Variables	Team Teaching on Understanding and Motivation	Learning Effectiveness	Student Learning Motivation	Team Teaching Method	Understanding Student Concepts	Correlation
Team Teaching on Understanding and Motivation	1,000	0.989	0.984	0.984	0.997	Correlation
Learning Effectiveness	0.989	1,000	0.982	0.983	0.989	Correlation
Student Learning Motivation	0.984	0.982	1,000	0.982	0.983	Correlation
Team Teaching Method	0.984	0.983	0.982	1,000	0.991	Correlation
Understanding Student Concepts	0.997	0.989	0.983	0.991	1,000	Correlation

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The results of the correlation analysis in Table 5 show a very strong relationship between all variables analyzed in this study. The correlation between the variables Team Teaching on Understanding and Motivation and Learning Effectiveness reached 0.989, indicating that improvements in the team teaching method are directly related to increased learning effectiveness. This reflects that when students better understand the concepts being taught, they are also more able to learn effectively. Furthermore, the correlation between Team Teaching Method and Understanding Student Concepts was 0.991, indicating that the teaching method not only positively influences student understanding but also makes a significant contribution to student success in understanding the material. In addition, the correlation between variables related to student learning motivation also showed a strong relationship, with a value of 0.984 between Team Teaching on Understanding and Motivation and Student Learning Motivation. Overall, these correlation results confirm that each variable in the study is interrelated and influences each other. This very strong relationship indicates that the consistent application of the team teaching method can improve student conceptual understanding and learning effectiveness, as well as encourage higher learning motivation.

Composite (rho_c)

Composite (rho_c) is a measure frequently used in model analysis and construct measurement that indicates the extent to which latent variables can be explained by observed variables in a model. In the educational context, particularly at SMP Negeri 4 Sentani, rho_c can be a useful tool for assessing the strength and accuracy of a teaching model or evaluation instrument.(Amiruddin et al., 2025)By calculating a composite score, educators can determine how well a teaching instrument or method reflects key factors such as student conceptual understanding and motivation.(Tahiroğlu & Özcan, 2025)The results of this analysis will help in designing a more effective learning approach, thereby improving the quality of education and student learning outcomes. To find out the results of the Composite test (rho_c), you can see Table 6 as follows.

Table 6. Composite test results (rho_c)

Variables	Composite reliability (rho_c)	Information
Team Teaching on Understanding and Motivation	0.970	Reliable
Learning Effectiveness	0.965	Reliable
Student Learning Motivation	0.970	Reliable
Team Teaching Method	0.965	Reliable
Understanding Student Concepts	0.965	Reliable

The results of the composite reliability analysis (rho_c) in Table 6 show that all variables in this study have a very high level of reliability and can be categorized as reliable. The Team Teaching on Understanding and Motivation variable has a rho_c value of 0.970, indicating excellent consistency in measurement. Similarly, Learning Effectiveness shows a value of 0.965, indicating that the measurement instrument is reliable and stable. In addition, Student Learning Motivation also recorded the same value of 0.970, confirming that student learning motivation was well measured. The Team Teaching Method and Understanding Student Concepts variables both achieved a composite reliability value of 0.965, indicating validity in the measurement of each construct. Overall, all rho_c values above 0.9 indicate that each construct measured in this study shows a high level of reliability, providing confidence that the analysis results are valid

and can be relied upon to draw conclusions about the effect of the team teaching method on student understanding and learning motivation.

Square R

R2, or the coefficient of determination, is a statistical measure that indicates the proportion of variation in a dependent variable that can be explained by the independent variables in a regression model. In the educational analysis at SMP Negeri 4 Sentani, R2 can be used to better understand how certain teaching methods can influence students' conceptual understanding in grade VII.(Kazondovi & Eliaser, 2025)By calculating the Square R value, educators can understand the extent to which factors such as teaching techniques, open materials, and student interaction can contribute to academic achievement. The results of this analysis provide insights for curriculum improvement and more effective teaching approaches, thus supporting the improvement of the quality of education. The results of the Square R test can be seen in Table 7 as follows.

Table 7. Results of the R Square test

Variables	Team Teaching on Understanding and Motivation	Learning Effectiveness	Student Learning Motivation	Team Teaching Method	Understanding Student Concepts	Information
Team Teaching on Understanding and Motivation						
Learning Effectiveness						Valid
Student Learning Motivation					0.210	Valid
Team Teaching Method					0,68,	Valid
Understanding Student Concepts		46,422				Valid

The results of the R-squared analysis in Table 7 above show a significant relationship between the variables in this study. For the Learning Effectiveness variable, a valid R-squared value indicates a positive contribution from the variable to student understanding in the context of team teaching. The Student Learning Motivation value shows an indicator of a sufficient relationship, with a value of 0.210, indicating that there is a measurable influence on student learning motivation by other factors. Meanwhile, for the Team Teaching Method, the R-square 0.68, which means that 68% of the variation in the dependent variable can be explained by the independent variables in the model. This value is within the valid range (0–1), so the model can be considered quite effective in explaining the relationship between variables. The remaining 32% of the variation is influenced by other factors outside the model or by variables not measured in this study.

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Discussion

The findings of the analysis conducted using SmartPLS found that the team teaching method had a significant impact on students' conceptual understanding at SMP Negeri 4 Sentani. The factor loadings for the team teaching method indicators were very high, especially for indicators X1, X2, and X5, with values above 0.9. This indicates that the implementation of the collaborative learning approach not only succeeded in increasing student engagement but also helped them understand the material more deeply. The three indicators—X1 (0.959), X2 (0.943), and X5 (0.941)—demonstrate the strength of this method in creating effective learning. In this context, the effectiveness of learning is also evident from the factor loading value which reached 0.979, which confirms that students not only understand the concepts but are also able to apply them in a broader context. Furthermore, the analysis shows that students' learning motivation also increased significantly. Most indicators for this variable showed loadings above 0.9, which means that students who have a good understanding of the material tend to have high learning motivation. However, one indicator (Y3.1) with a loading of 0.291 highlights the challenges in improving motivation. This could be due to various external factors, such as the learning environment or lack of parental support. This finding suggests that while the team teaching method is highly effective, other factors need to be considered to further enhance student motivation. Continuing to the analysis of the factor loading table, several important findings can be identified regarding the influence of the team teaching method. Indicators such as X1, X2, and X5 show very high loadings, indicating that this method contributes significantly to learning success. Furthermore, examining the Understanding Student Concepts variable shows that indicators Y1.1 to Y1.5 have good factor loadings, ranging from 0.899 to 0.924. This indicates that students gain a better understanding after implementing the team teaching method. The Learning Effectiveness variable also shows high results, with several indicators, such as Y2.1 and Y2.5, having factor loadings of 0.955 and 0.964, respectively, indicating good learning effectiveness. However, the Y2.3 indicator shows a loading value of 0.865, which indicates that there is room for improvement in this area.

The average variance extracted (AVE) also indicates that all analyzed variables are valid. For the Team Teaching on Understanding and Motivation variable, the AVE value of 0.865 indicates that this method has a significant influence on student understanding and motivation. In addition, Learning Effectiveness with an AVE value of 0.847 reflects good learning effectiveness. The Student Learning Motivation variable has the highest AVE value at 0.866, confirming that the measured student motivation is strong and consistent. The Team Teaching Method and Understanding Student Concepts variables, with AVE values of 0.847 and 0.845, respectively, indicate validity in the measurement. Thus, all AVE values above 0.5 indicate that the measurement instrument used in this study is valid and reliable. Examination of the loading pretext also showed encouraging results. The indicators showed higher loading values against the expected constructs compared to other constructs. This reflects the measurement instrument's ability to differentiate between different variables. For example, indicator X1 has the highest loading value for Team Teaching Method (0.959), and also shows significant values for Learning Effectiveness (0.942) and Student Learning Motivation (0.922). Similar findings are also seen in indicators X2, X4, and X5, which show loadings above 0.9. The accuracy of these measurements indicates that students can accurately recognize and respond to the teaching methods received. Furthermore, indicators of Learning Effectiveness, such as Y2.1 and Y2.4 with loadings of 0.930 and 0.946, show consistent and valid results. On the other hand, indicators Z1.1 and Z2.1 related to student learning motivation also show significant values, with loadings above 0.9. These cross-loading results further strengthen that all constructs measured

in this study have high validity, supporting the hypothesis about the effectiveness of the team teaching method in improving student understanding and learning motivation.

Correlation analysis further demonstrated a strong relationship between all variables in this study. The correlation between Team Teaching on Understanding and Motivation and Learning Effectiveness reached 0.989, indicating that improvements in team teaching methods are directly related to learning effectiveness. When students deeply understand the concepts taught, their learning outcomes become more effective. Furthermore, the correlation between Team Teaching Method and Understanding Student Concepts reached 0.991, indicating that the teaching method not only positively influences student understanding but also contributes significantly to their success in understanding the material. The correlation of 0.984 between Team Teaching on Understanding and Motivation and Student Learning Motivation further confirms that the consistent implementation of team teaching methods can improve student learning motivation. These correlation results indicate that each variable is interconnected and influences each other. This strong relationship suggests that to achieve progress in education, it is important to implement collaborative methods, such as team teaching, which not only improve understanding but also encourage student learning motivation.

Composite reliability (rho_c) analysis provides further insight into the validity of the instruments used in this study. All variables, including Team Teaching on Understanding and Motivation, Learning Effectiveness, and Student Learning Motivation, showed rho_c values above 0.9, indicating high consistency in measurement. A rho_c of 0.970 for Team Teaching on Understanding and Motivation indicates that the instrument is highly reliable. Similar findings apply to Learning Effectiveness, which has a rho_c value of 0.965, indicating that the measurement of learning effectiveness is carried out well. This panorama proves that the teaching method implemented at SMP Negeri 4 Sentani has a positive impact on students. With the team teaching approach, students not only gain better understanding but also experience a significant increase in learning motivation. Considering the positively affected variables other than the teaching method itself, there is room for experimentation with external factors that may influence student motivation.

The results of the R-squared analysis indicate a significant relationship between the variables in this study. The R-squared values for Learning Effectiveness and Team Teaching Method each indicate a significant contribution to student understanding in the context of team teaching. Meanwhile, the higher R-squared value for Team Teaching Method indicates that this method has a significantly greater impact on student understanding than the other variables. In conclusion, this study emphasizes the importance of a collaborative approach in education. The use of team teaching methods can improve students' conceptual understanding and overall learning effectiveness. It is recommended that educators consider integrating this method into their practice, with an emphasis on increasing student motivation to achieve optimal learning outcomes on a broader scale. Further research is also important to explore other factors that may influence student learning motivation, so that teaching methods can be further refined and relevant to students' needs.

Conclusion

This study shows that the team teaching method significantly improves students' conceptual understanding and learning motivation at SMP Negeri 4 Sentani. With high factor loadings for related indicators, particularly for the Team Teaching Method and Student Concept Understanding variables, the results confirm the effectiveness of this collaborative approach in creating a more interactive and engaging learning experience. Although most learning motivation

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indicators showed positive results, one indicator indicated a challenge that needs attention. Findings from the AVE analysis, cross-loadings, and correlations also reinforce that both conceptual understanding and learning effectiveness are closely related. Therefore, it is important for educators to continue adopting this method and consider other factors that can influence student motivation, in order to achieve maximum learning outcomes that are relevant to students' future needs.

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