



## Increasing Activity and Science Learning Outcomes Vibrations, Waves and Sound Matter Through STAD Model

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### Article Info

#### Article history:

Received Jan 15, 2024

Revised Feb 23, 2024

Accepted Mar 6, 2024

OnlineFirst Mar 20, 2024

#### Keywords:

Science Learning Outcomes

Sound Matter

STAD Model

Vibrations

Waves

### ABSTRACT

**Purpose of the study:** In this research aims to determine increasing activity and science learning outcomes vibrations, waves and sound matter through student teams-achievement divisions (STAD) model.

**Methodology:** This research is Classroom Action Research implemented in three cycles, each cycle consisting of four stages namely planning, observation, observation and reflection. The subject of this research are students of class VIII B of Pabelan 2 Public Middle School consisting of 32 students of 16 male students and 16 female students. Research instruments include observation guide sheet, questions and documentation guidelines.

**Main Findings:** The results of the research show that the student teams achievement divisions (STAD) learning model can increase the activity and learning outcomes of Class VIII B students at State Middle Schools as evidenced by the increase in student learning completeness in Cycle I, 37.5% of students have completed learning, in Cycle II, 81% of students have completed learning and Cycle III 99% of students completed their studies.

**Novelty/Originality of this study:** This research contributes to research with a new foundation in understanding scientific concepts through an innovative approach using the student teams-achievement divisions (STAD) model. The unique findings highlight STAD's significant contribution in stimulating student engagement and increasing achievement of learning outcomes, bringing new nuances to science education research.

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## 1. INTRODUCTION

Natural science is a human effort to understand the universe through precise observations on targets and using correct procedures and explained by reasoning so that correct conclusions are produced. Science is different from religion, science is used to seek explanations about the origin, nature and processes that occur in the universe that can be physically seen [1]–[3]. Meanwhile, religion is used to seek an explanation of the meaning of human existence in this world, to understand the human soul, determine what happens after death and determine the form of worship that humans should carry out. Science is not a definite truth, science only seeks explanations about the universe and science explanations are tested based on evidence originating from the universe itself [4]–[6]. These evidences are obtained through the five senses. Science knowledge is quite reliable even though it is tentative [7]–

[9]. Therefore, natural science is not dogmatic and the truth of natural science is ready to be reviewed, ready to be revised and ready to be reexamined.

Science learning in junior high school is a teacher's effort to teach students through the application of various learning models that are deemed appropriate to the characteristics of junior high school children [10]–[12]. The success of science learning depends on appropriate learning strategies and methods, and student success does not only depend on educational facilities and infrastructure, curriculum and methods, but teachers have a very strategic position in improving student achievement by using appropriate learning strategies and being able to motivate students. in science learning [4], [13], [14]. Science learning in schools currently tends to emphasize science products only, such as facts, law, theory getting the dominant portion, so that aspects, processes and attitudes do not get a sufficient portion [15], [16]. This is reinforced by the implementation of science learning in the field where teachers mostly give lectures and a number of materials that students have to memorize, so that they can work on the questions. In fact, it is not uncommon for students to complain because they do not understand the material or concepts taught by the teacher. This is in stark contrast to the essence of science learning which includes products, processes and attitudes. This causes students to be less trained to develop their reasoning power in solving problems and applying the concepts they have learned in real life.

The fact is that in schools, especially at the junior high school or Madrasah Tsanawiyah level, science subjects are not fun subjects but rather less interesting. Starting from class VII to class IX, this subject is of little interest to most students. This is based on an initial survey conducted by researchers on class VIII B students of Pabelan 2 Public Middle School, Semarang Regency. The activity and learning outcomes of science at Pabelan 2 Public Middle School, Semarang Regency are still low, as evidenced by students who are passive in asking, answering questions or coming to the front of the class during the learning process. And many students' learning outcomes have not yet reached the minimum completeness criteria. This is because teachers only use the lecture method when delivering learning material, making it difficult for students to understand. Student learning styles greatly influence students' understanding of learning material, so the learning method chosen by the teacher must be changed to a learning method that can facilitate all types of learning styles [17], [18]. So that the science learning process is less successful, this makes students tend to pay less attention to the teacher's explanations and become busy themselves, which results in the classroom atmosphere becoming noisy and disoriented. To support learning in the classroom, supporting facilities and infrastructure are needed in the form of tools or media.

In the world of education, the terms aids or communication media are often used interchangeably or as substitutes for the term educational (learning) media [19]–[21]. Through the use of tools in the form of media, it gives hope that communication relations will improve so that they can run smoothly and with maximum results. A medium is any physical device used to convey the content of teaching material. In this sense, books/modules, tape recorders, cassettes, video recorders, video cameras, television, radio, films, slides, pictures and computers are learning media. In addition to using methods that can support the learning process and are a means of achieving learning completeness, media or learning media is needed which can increase students' desire and curiosity about a problem because with learning media students can see directly the form of a replica of something explained by the teacher so that students can understand the lessons that will be given by the teacher.

The use of learning media in the learning process can also increase understanding of concepts and can increase student creativity, make students more interested in paying attention to explanations from the teacher and can also help students to receive information with all five senses [22]–[24]. That learning achievement or understanding of concepts is the level of humanity possessed by students in accepting, rejecting and assessing information obtained in the teaching and learning process [25], [26]. From the problems explained previously, many method criteria are needed. Therefore, to overcome this problem, the method used must be interesting, not boring and able to overcome existing problems. In this research, the author tries to apply the Student Teams-Achievement Divisions (STAD) model.

Model is a discussion model that has been further developed so that it becomes an interesting discussion. This model encourages students to be active in the science learning process [27], [28]. With methods like this, students can be more expressive so that they can easily master science learning material. This research has significant urgency in the context of improving the quality of science learning at junior high school level, especially in Vibration, Waves and Sound material. By adopting the student teams-achievement divisions (STAD) [29], [30].

This research is in line with research conducted by Wacner [31] those discussing the STAD model, model STAD as a learning approach, this research aims to explore the potential and effectiveness of this collaborative method in improving student activities and learning outcomes. The urgency lies in the need for innovative learning approaches that can increase student participation and holistic understanding of concepts [32]–[34]. The aim of this research is to contribute to the science education literature, provide a deeper understanding of the implementation of STAD in the context of science learning, and provide practical guidance for teachers to improve the quality of science learning in the classroom. By understanding the potential of STAD in the specific context of this material, it is hoped that this research can provide a basis for developing more effective and sustainable learning strategies.

This research brings an innovative contribution with an approach that focuses on the student teams-achievement divisions (STAD) Model in improving student activities and learning outcomes in Vibration, Waves and Sound material at the junior high school level. The novelty of this research lies in the application of STAD which has not been explored in depth in the context of this particular material. This research not only provides insight into the effectiveness of STAD in science learning, but also offers new insights into how collaborative approaches can be specifically integrated to enhance students' understanding of complex concepts. Therefore, this research can be considered a new contribution in the ongoing efforts to enrich learning and research methods in the field of science education. In this research aims to determine increasing activity and science learning outcomes vibrations, waves and sound matter through student teams-achievement divisions (STAD) model.

## **2. RESEARCH METHOD**

### **2.1 Types of Research**

This research adopted a Classroom Action Research approach which was carried out in three cycles. Each cycle is structured in detail, consisting of four main stages, namely planning, implementation, observation and reflection [35]. This approach allows researchers to systematically monitor and disseminate the impact of implementing the Student Teams-Achievement Divisions (STAD) Model on student activities and learning outcomes in class VIII B of Pabelan 2 Public Middle School.

### **2.2 Population and Sample**

The research population included all 32 students in class VIII B of Pabelan 2 Public Middle School, with details of 16 male students and 16 female students. The subjects of this study were selected by purposive sampling, ensuring balanced representation of both genders. By selecting samples from one class, it is hoped that it can provide an in-depth picture of the effectiveness of applying STAD to Vibration, Waves and Sound material.

### **2.3 Data Collection Techniques**

This research uses various instruments to collect data. The instrument includes an observation sheet guide to record student participation levels, question guides to measure concept understanding, and documentation to obtain additional data. With this combination of instruments, research can provide a comprehensive picture of changes in student activities and learning outcomes during the implementation of STAD.

### **2.4 Data Analysis Techniques**

The data analysis process in this research will be carried out holistically. Data from observations, question evaluations, and documentation will be analyzed qualitatively and quantitatively. Qualitative analysis will focus on analyzing student participation patterns and the development of their conceptual understanding, while quantitative analysis will include statistical calculations to measure significant differences before and after implementing STAD [36], [37]. Thus, this data analysis technique will provide in-depth insight into the impact of implementing STAD on Vibration, Waves and Sound material in the classroom environment.

### **2.5 Research Procedures**

This research procedure applies the classroom action research stages which consist of four main steps: Planning, Action, Observation, and Reflection. In the planning stage, research focuses on determining when, where, by whom, what, why, and how the action will be carried out. Collaboration between teachers and researchers is emphasized to reduce observer subjectivity and increase observation accuracy. This stage involves identifying and analyzing the problem, determining the reasons for the research, formulating the problem, determining methods and action hypotheses, as well as determining how to test the hypothesis with success indicators and data collection instruments. The details include important steps such as clearly defining the problem and detailing an action plan.

## **3. RESULTS AND DISCUSSION**

Judging from the problems that occur in the schools studied, the learning methods used tend to be monotonous and less interesting, students even feel bored, especially as science subjects tend to be considered difficult for students, so that students cannot easily understand the material presented by the teacher. This situation is very sad if secondary level students' science subjects have grades below the minimum completeness criteria, 112, as is the case at Pabelan 2 Public Middle School, Semarang Regency, namely 6.50. By using the Student Teams-Achievement Divisions (STAD) method, it is hoped that students can improve their learning outcomes. Data Analysis and Research Per Cycle 1. Pre-cycle data was obtained from the scores before classroom action research was carried out. The science learning completeness score uses the Minimum Completeness Criteria score for class VIII Pabelan 2 Public Middle School in the science subject, namely 65. The learning outcome score in this pre-cycle is an indicator of increasing student learning outcomes in the science subject, the results of which

will have an effect on improving the results. student learning. It is known that the science learning outcomes of class VIII students at Pabelan 2 Public Middle School are still low. Namely, out of a total of 32 students, only 15 students got a complete score and 17 other students were still below the minimum completeness criteria. The results of student learning evaluations in the pre-cycle can be seen in Table 4.1, it was found that 47% of students achieved the minimum completeness criteria or 15 students out of 32 students, meaning there were 53% or 17 students who had not completed their studies, on average students could not do question number 3, 4, and 5. Based on the results of observations, this is due to students' lack of motivation in learning, for this reason learning improvements need to be made.

1. Pre-Cycle From the data on student learning outcomes before learning was carried out using the student teams-achievement divisions (STAD) model, it can be seen that science learning for class VIII students at SMP Negeri 2 Pabelan was still low, that is, out of a total of 32 students, only 15 students got grades. completed and 17 other students were still below the minimum completion criteria. The fifteen students who have completed are students who have above average intelligence so that with the lecture method alone they can understand the content of the material being taught.

These results indicate that the increase in student learning outcomes regarding science learning material is still low. For this reason, a new learning method is implemented which seeks to increase student activity and learning outcomes, namely by using the student teams-achievement divisions (STAD) model.

2. Cycle I In cycle I data collection used student activity observation sheets, teacher activity observation sheets and formative tests. From the student learning observation sheet, data was obtained regarding students' attention in receiving material, activeness in the learning process and students' ability to work together in their groups with the aim of instilling the ability to socialize and work together. Meanwhile, student learning outcomes are obtained from assignment scores and test scores. Student activity and attention are indicators of motivation from internal and external factors. One of these external factors is the selection of the appropriate approach and use of methods for students, as well as the suitability of the chosen approach and method to the material. Therefore, four aspects of students, namely learning outcomes, attention, activeness and ability to collaborate in groups, are the main things that are highlighted in the research. Meanwhile, observing teacher activities is to find out aspects of the teacher that influence the learning process.
  - a. Observation Results of Teacher Activities From the results of observations of teacher activities, it was recorded that 1 item received a very good response, 8 items received a good response, 2 items received a very good response. These results require teachers and researchers to make improvements in cycle II
  - b. Observation Results of Student Activity Based on analysis of observation results of student activity which includes student attention, involvement and cooperation when learning took place in cycle I

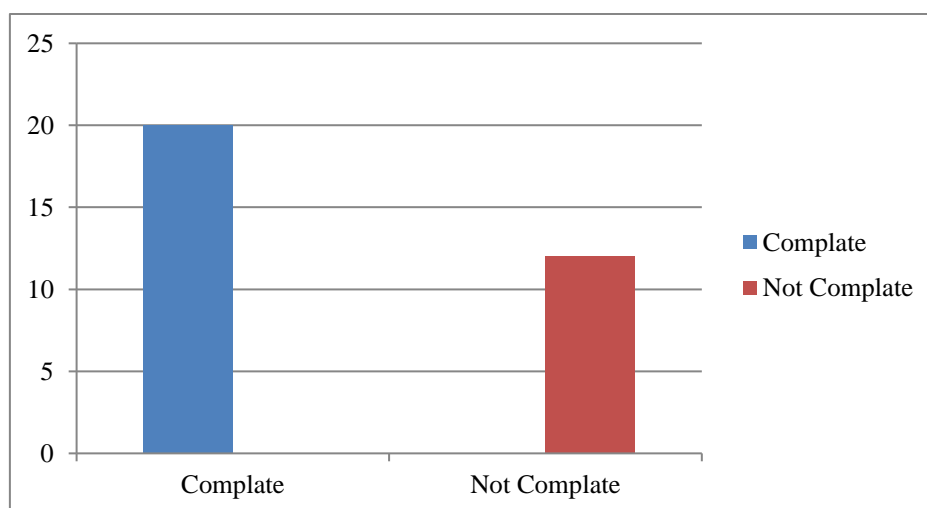


Figure 1. Completion Diagram in Cycle I

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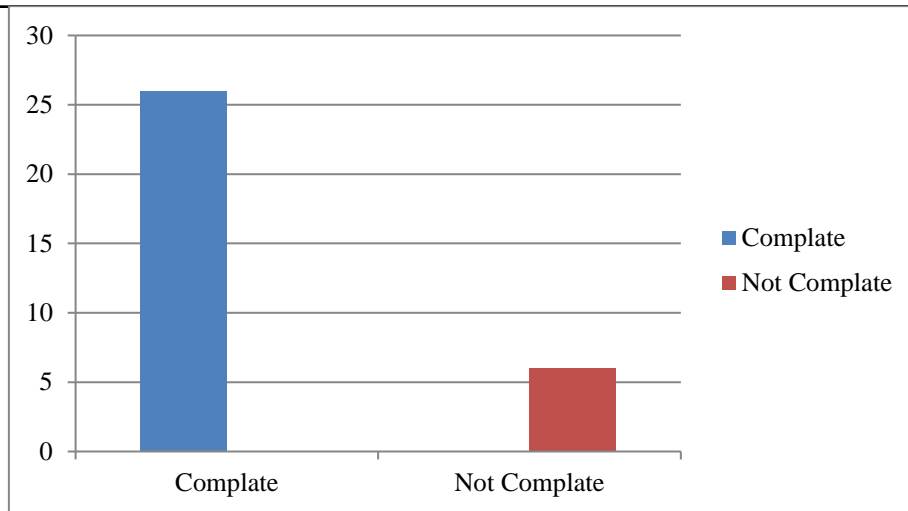


Figure 2. Completion Diagram in Cycle II

The diagram above of the results of student assignments and formative tests in cycle III shows that 31 students have been declared complete because they have received a score equal to or more than the minimum completeness criteria, namely 65, while 1 student still got a score below the minimum completeness criteria. This is because this student often plays truant during class time and doesn't pay attention to the teacher.

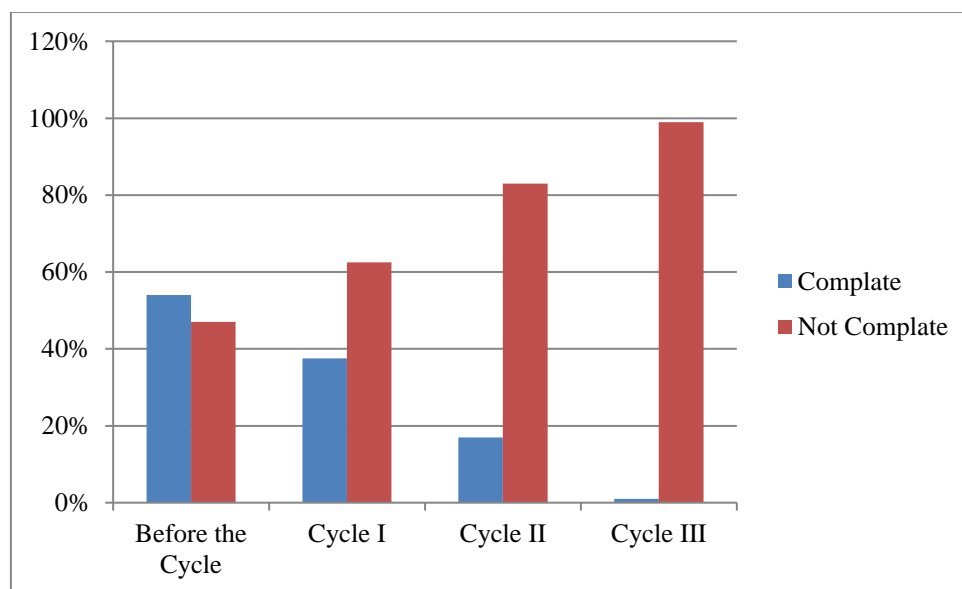


Figure 3. Completion Diagram in Cycle III

In the diagram above it can be concluded that from the Pre-Cycle activities the level of completeness was 47% and incomplete level was 53%, increasing in Cycle I with a level of completeness of 62.5% and incomplete level of 37.5%. In Cycle II it increased again with a complete level of 81% and 19% incomplete, until in Cycle III it still continued to increase and was almost towards perfection, namely with a complete level of 99% and only 1% incomplete.

The same previous research was also carried out by Marshel and Ratnawulan, [10] in his research which stated that the student teams-achievement divisions (STAD) type cooperative learning model had succeeded in improving learning outcomes in the affective domain of students' interests. This is proven by the number of students who obtain very good and/or good criteria in one class. There is a significant gap in research that specifically focuses on the application of the STAD Model to improve student activities and learning outcomes. Most previous research focuses more on conventional teaching approaches or individual learning strategies, while collaborative approaches such as STAD are still less explored in depth [38], [39]. Therefore, there is an urgent need to fill this gap by investigating the potential and effectiveness of STAD in improving science learning, especially in Vibration, Waves and Sound material. This research will provide a valuable contribution to the practical and theoretical understanding of the application of collaborative strategies in the context of science learning in schools.

The implications of this research are very relevant for the development of science education at the junior high school level. The research results show that the application of the student teams-achievement divisions model specifically on Vibration, Waves and Sound material has a positive impact on student activities and learning outcomes. The implications include the possibility of adopting the STAD method by teachers as a learning strategy that can improve students' social interactions and conceptual understanding. In addition, the findings of this research also provide a basis for developing a curriculum that is more contextual and integrates collaborative approaches in science learning [40], [41]. Furthermore, the results of this research can be a source of inspiration for educational researchers and practitioners in designing further research and creating innovations in science teaching methods in secondary schools. This implication underlines the relevance and potential positive influence of implementing the STAD approach in efforts to improve the quality of science education at the junior high school level.

This research makes a significant contribution in the context of increasing science learning activities and outcomes in Vibration, Waves and Sound material through the application of the STAD model. Through this approach, we introduce innovation by integrating collaborative learning elements in the science classroom environment. The novelty of this research lies in the special emphasis on teamwork, clear division of roles, and alignment of student learning strategies. We also detail the implementation of the STAD method with the use of engaging and interactive multimedia resources. The results show that this approach not only improves students' academic performance, but also stimulates their active participation in natural science and development of social skills. This research makes a unique contribution to the science learning literature by presenting an innovative strategy that can be adopted by educators as an effective alternative in improving the quality of science learning in schools.

#### 4. CONCLUSION

Based on this research, it can be concluded that the application of the Student Teams-Achievement Divisions (STAD) Model is effective in improving science learning activities and outcomes in vibration, wave and sound materials. The use of STAD makes a positive contribution to students' active participation in learning, thereby increasing their understanding of the material. Student learning outcomes also showed a significant increase, indicating that a collaborative approach through STAD can have a positive impact on academic achievement in the context of science learning. The implications of these findings can be the basis for developing more interactive and collaborative learning methods in an effort to increase the effectiveness of science learning in the future. Researchers recommend that future research explore the role of parent involvement in supporting collaborative learning initiatives such as the STAD Model. Evaluate how parents can contribute to strengthening learning outcomes at home.

#### ACKNOWLEDGEMENTS

The author thanks all parties who have supported this research.

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